Education and Technology Series

WORD PROCESSING IN ELEMENTARY SCHOOLS

Seven Case Studies

JACK BARON, Principal Investigator
Contributors
ELIZABETH LEWIS
BARBARA SPENCER

This research project was funded under contract by the Ministry of Education, Ontario. It reflects the views of the authors and not necessarily those of the Ministry.

The Honourable Bob Welch, Minister
Dennis A. Wright, Deputy Minister

Ministry of Education
Ontario

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The Honourable Sean Conway, Minister
Bernard J. Shapiro, Deputy Minister

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ABSTRACT

As a result of preliminary observations of word processing in elementary level language programs, the purpose of this study was formulated as an exploration into current word processing practice and the conditions necessary to support its use as a language tool. Age of student, location and availability of equipment, and type of program were observed to be major determinants of patterns of use. Thus, younger and older students, classrooms and labs, and regular and special education programs were represented. Seven classroom programs, exemplary in their commitment to the use of word processing, were chosen as case studies which might illuminate the present state of word processing and issues surrounding it. All cases had access to four or more microcomputers. Programs were visited regularly by an observer for the duration of the 1985-86 school year. A qualitative, descriptive methodology was employed based on ethnographic principles resulting in extensive note taking and ongoing analysis of data. Data were organized in terms of context, task and outcome. While task could be described as any particular word processing activity, context included all of the conditions surrounding the task. Thus, outcomes were viewed as the result of task in context. As would be expected, the cases yielded a variety of findings; some idiosyncratic, others more generalizable. Many issues emerged. Results indicated that in all cases students appeared to enjoy using word processing. Teachers viewed it as motivational and beneficial to students. However, other attributes, both positive and negative, depended upon the type of context observed. For example, the regular classroom setting appeared to face the greatest constraints to the integration of word processing as a language tool. Labs that could provide regular access, particularly to older students, seemed most promising in terms of actually demonstrating the potential of word processing to become an integral component of the writing process. Consideration of a number of issues led to these conclusions. Implications of these and other findings are discussed.

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I wish to thank all the people that helped with this research. Special thanks to the Etobicoke, East York and North York boards of education for granting access to their systems, to the Computer and Language Arts consultants of these boards for suggesting sites for study, to the principals and teachers in the schools for their active collaboration, to Geoff Day, Consultant - Computer Applications of the York board for all his help, to Pat Steenbergen and Sheila Moll of the York board Professional Library, and to Carol Ricci for typing the interim reports as well as this final report.

It is important to state for the record that Elizabeth Lines did the bulk of the work, played a decisive role in determining the methodology, and wrote this report. In fact, it is very much her study and her report.

Jack Murray,
Principal Investigator

INTRODUCTION

This study examined how word processing is being used in elementary schools to facilitate language development. The study was conducted in two stages. During the first phase more than two dozen schools were visited, teachers were interviewed and observations made of classrooms in action. As a result, seven programs in six schools were selected for more intensive study over a full school year. This preliminary investigation also led the study team to reconsider the methodology. The method was shifted from a quasi-quantitative to a more qualitative approach. Also, the focus was broadened to give more attention to situational factors and to teachers' intentions.

The second phase of the study consisted of seven case studies. These cases represent a wide range of word processing applications. They illustrate what is being done by some committed teachers using microcomputers to help their pupils learn to read and write. It is hoped that their stories will help others use this powerful new tool effectively.

PRELIMINARY INVESTIGATION

Twenty-nine classroom programs, representing 26 schools and seven boards of education in the Metropolitan Toronto area were visited in the winter and spring of 1985. These programs were nominated as extensive users of word processing by computer or language consultants of each board. The classrooms included regular programs (n=14), English as a Second Language (n=4), Literacy programs (n=5), and Special education (n=6). Of the 14 regular programs visited, ten were Junior (K-5 or K-6) and four were Senior (7 and 8).

Most of the data collected resulted from interviews with teachers. The interviews were supplemented wherever possible with direct observations of students using word processing. In summarizing the data, a serious effort was made to preserve the richness of the contexts of the word processing applications. From this initial stage of research, some of the salient issues surrounding the use of word processing were identified.

These issues included the number of microcomputers available, their location, scheduling of word processing time, actual word processing activities, keyboarding skills, demands on teacher time, changes to teacher role, and the role of peers in the composing or editing process. In a larger sense, the data suggested that certain conditions must prevail for word processing to be beneficial to language development. These conditions for success would include the amount of time spent on word processing, the way in which word processing is fitted to a teacher's language program, and the overall context that allowed for the integration of word processing in the classroom setting.

Generally, teachers and students were enthusiastic. At the very least, word processing was seen as motivating to the writing process. Students enjoyed the ease of correction and the clean end product. But, due to numerous practical constraints, the potential for word processing as a language tool appeared largely unrealized in most cases.

PURPOSE

These findings suggested the importance of contextual factors that affect the actual use of word processing in any given classroom situation. Rather than ask if word processing can improve students' language facility, this research explored the surrounding conditions that influence the viability of word processing as an effective language development tool. Given the realities of the school system, what is actually possible? What does word processing actually look like in the context of a classroom program? If one wants word processing to work as a language facilitator, what approaches can be taken to achieve this end?

The purpose, then, was to address these issues by describing how word processing is used in a variety of elementary classroom settings. This type of approach should illuminate the potential of word processing as a language tool and point to some of the changes that might be required to accommodate its use in elementary schools. The results should be of interest to educators who view word processing as a potentially valuable application of computer technology. As well, it should stimulate future research questions.

METHOD

CASE SELECTION

It was decided that the purpose of this research could best be served through the study of exemplary cases. Such cases would illustrate what is possible, and the positive and negative features of these possibilities. Thus, one important criterion for inclusion in this study was the demonstrated interest and concerted effort on the part of the teacher to apply word processing to language activities in a 'successful' fashion ('success' being the teacher's perception of the outcome).

As well as teacher motivation, criteria for selection included the number and location of computers available for word processing. These two factors were deemed to be critical in determining patterns of use. In addition, it was considered important to represent both younger and older students, regular programs and special education.

Seven school programs, representing six schools and four boards of education in Metropolitan Toronto, were selected by June 1985. Each case included students from a range of socio-economic and ethnic backgrounds.

DATA COLLECTION AND ANALYSIS

Data collection for the main study began in the fall of 1985 and proceeded through the spring of 1986. One observer visited each site on a regular basis. Approximately 15 visits were made to each program. Each observation period took from one to one and a half hours. Both the number and length of visits varied according to the specific nature of each case.

The data collection process involved extensive note taking during and immediately following each observation period. Notes included not only the direct observations, but also impressions and questions stemming from them.

With an ethnographic type of approach such as this, data analysis was ongoing. Notes were continually reviewed and questions compiled to be investigated during subsequent observation periods. Some questions were best answered by speaking with the teacher or students, others by more sharply focused observation.

This open-ended inquiry process allowed for the emergence of new, possibly important features. Generally, if features were significant, it was assumed they would recur, thus providing some check of reliability. The reliability and validity of the observations were further checked by having a second observer visit each site for the duration of one observation period. Finally, teachers were requested to read and respond to drafts of this report.

EMERGING CONCEPTUAL FRAMEWORK

This type of approach spawned certain methodological concerns. Entering a classroom situation for the purpose of observation is a difficult task. On one level there is the question of purpose: what needs to be seen in order to address the topic successfully? On another level are methodological issues: what can an observer actually see and what inferences can be made from these observations? Finally, there is the communication issue: how can the observations be synthesized to facilitate sharing the findings with others? These issues are not unrelated; neither are they easily answered.

During the course of early observation sessions at all sites, a conceptual framework was developed through ongoing data analyses. This conceptualization provided a way of focusing the observations without imposing rigid limitations on what might constitute relevant data, that is, it suggested a way of seeing, a way of structuring the data without predetermining what could be seen. Further, it provided a way of reporting the findings to others in an intelligible manner. This framework facilitated the data collection process, the analyses and the reporting of results.

The key components of this framework, or organizing structure, consisted of context, task, and outcome. All observations could be subsumed by one or more of these broad categories. The types of observations assigned to each category are illustrated in the following paragraphs.

Context

Context referred to the physical, social and organizational aspects of the classroom situation. Some of these are fluid, others stable, while still others change gradually over time. Context in the largest sense includes all of the circumstances that surround the use of word processing. As well as the physical environment, context encompasses the relationships among students and the role of the teacher in the particular setting.

Task

What is the nature of the word processing activity? Is it a highly or loosely structured work assignment? What is its purpose? What skills does it require? Do students attend to it? The notion of task provides a focus point. It can be seen. It can be described.

Outcome

The outcome is, in effect, the result of the execution of the task in context. What is the outcome? It is both the product and the perceptions surrounding it. It could be quantified as the number of lines written per class period, or number of stories per month. It might be expressions of enthusiasm, frustration, boredom or delight. Outcomes also can change as the conduct of the task proceeds.

The following presentation of cases generally conforms to this framework. However, these categories are not entirely mutually exclusive. Some features may seem to apply, for example, to both context and outcome. Socializing amongst students can be part of the milieu as well as an outcome of certain tasks.

Due to the diversity of cases, the attention given to each of the three constructs varied. For example, monitoring of an individual's progress was possible and appropriate in some cases, but not in others. Likewise, in some cases several distinct tasks were addressed, while in others the task remained relatively constant.

Thus, the rationale underlying the structure of this report is the same as that applied to the data collection and analysis process. That is, the structure exists primarily for the sake of clarity. It is certainly not the only way in which these cases could be viewed. It is a way of guiding the reader as it guided the research. Like word processing, it was developed as a means to an end, not an end in itself. Thus, the details of each case are presented in a format that seemed best to highlight its distinctive features.

In offering an overall picture of each program some depth has been exchanged for breadth. Specific examples of certain features have been included in an attempt to convey the richness of the data collected.

CASE NO. 1

Grade:	7 and 8
Number of classes:	4 x Grade 7 4 x Grade 8 1 x Grade 7/8
Number of students:	32-35 students per class except for one class of 25
Teachers:	Two of the English teachers teach all of the word processing
Location of machines:	One classroom (lab) used exclusively for word processing
Scheduling:	Every other day for 40 minutes at a time
Hardware:	35 Commodore PET 8032's 5 dual disk drives 5 printers
Software:	ComputerType, Superscript

INTRODUCTION

This lab was located in a junior high school (Grades 7, 8 and 9) with a student population of approximately 450. The students represented a range of ethnic backgrounds, though Canadian born students of Greek descent predominated (at least 50%). Socio-economic status ranged from lower to upper middle class. In part, due to the fact that a large number of students came from homes where a language other than English was spoken, the school placed an emphasis on the English curriculum.

This case represented the only situation where a full class of students was accommodated at one time for word processing. Further, this computer lab was used exclusively for keyboarding and word processing activities. The school has been at the forefront of microcomputer applications for several years.

This past school year was the second year of operation of the word processing lab. It was operated both years by the same two English teachers. One of them had an extensive background in computers (Mr. A). The other's computer experience was limited (Mr. B).

Traditionally, students were taught English, History and Geography (core subjects) by one teacher. Since the inception of the word processing lab, the teaching of English to any one

class has been divided between the word processing teachers and the other core subject instructors. Throughout this past school year, the core teachers were pursuing the study of word processing so that in future, all of the English can again be taught by the same teacher. The eventual goal is to make the lab accessible for the teaching of all core subjects.

The case reflects a highly structured approach to the integration of word processing into the language program. Serious attention has been paid to overcoming practical constraints. One of the goals was to ensure that the writing done on the word processor represented the student's writing ability, rather than the ability to operate the equipment.

The year was divided into three components. Typing skills were taught for the duration of the first term. On alternate days, the teachers were responsible for the teaching of guidance to their English students. Word processing skills were addressed during the month of January. The writing itself was pursued for the remainder of the school year. It seemed evident during the previous year that word processing could increase quantity of product. This year, the concern was for quality.

Most often, each visit to this school included observations of a class conducted by each of the two teachers. A high ability split Grade 7/8 class of Mr. B was observed regularly. One regular Grade 8 class of Mr. A provided a second classroom situation. While bound by the same purpose and technology, these two teachers displayed individual approaches to the teaching of the English/word processing program.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The computers were on typing tables side by side along the four walls of a regular size classroom. In addition, two rows were placed back to back down the centre of the room. Five printers were distributed throughout the room. Because the room was full of computers and the students were older, its atmosphere was that of a working environment. The furniture was of appropriate proportions for most students. The absence of individual disk drives allowed for space on table surfaces for written or draft copy.

CLASSROOM MILIEU

The teachers' roles in this type of setting were those of assistants to the process in which the students were involved. It was a student-directed learning process with students proceeding at individual rates, requesting assistance when necessary. Students were involved with the task and demonstrated no outward signs of frustration or lack of interest. It appeared to be a comfortable environment for the students. A certain amount of conversation between students was expected and allowed.

Communication between the two teachers occurred largely on an informal basis. They appeared flexible in their approach to the program, monitoring its progress and pitfalls

carefully, and open to changes. At one point there was talk of changing the schedule of Grade 7 and 8 typing from one day on/one day off to daily classes for three weeks followed by three weeks off. This idea was the result of one of the teacher's perceptions that the Grade 9's were progressing much faster by having daily typing. In the end the schedule was not changed, since three weeks without typing was viewed as too long a period to maintain gains. This is an example of the ongoing conversation and concern demonstrated by the teachers involved.

TASKS AND OUTCOMES

TYPING COMPONENT

With ComputerType, an instructional software program, students type either from the screen or printed copy. The lesson exercises are presented on screen, while tests of each lesson are typed from copy. There are 32 lessons in total. Students work at their own pace. Record sheets allow students to keep track of their speed and accuracy for each lesson. Both the student and the teacher retain a copy of these results. The nature of the program itself makes this a highly structured task.

The progress tests are easy to mark as they report percentage of error and words per minute (w.p.m.). For the purpose of student progress evaluation, grade percentages were assigned to the error rates. During the fall term, emphasis was placed on correct typing protocol, i.e., fingering, posture, and accuracy. Marks were deducted if students looked at the keys too often, showed insufficient regard for posture, or used incorrect fingering. Minimal attention was given to speed. Students worked up to Lesson 25 which provided practice with the entire keyboard except for the number keys.

Due to the nature of the task, the meaning of the outcome is readily apparent. Typing in itself is a 'practice makes perfect' skill. As one of the teachers told the students, "Typing is training, not thinking, training". However, the long term outcome of the whole process was to be gauged in terms of its application to the composition/word processing task.

The two teachers had slightly different approaches to the question of typing speed. While both agreed that the first commitment was to familiarity with the keyboard and the ability to touch type, Mr. B felt that typing speed should be addressed to some extent during the fall term. Thus, he required that students be able to type five w.p.m. for the test of Lesson 20 material and ten w.p.m. by Lesson 25. Students would continue to work through Lessons 20 to 25 in an attempt to increase their speed to 20 or 30 w.p.m., while retaining acceptable levels of accuracy.

The teachers circulated throughout the classroom, responding to students' needs, reminding students of proper technique, and 'testing' students by covering the keyboard as they typed. Those students who were doing poorly would be seated together near the teacher's desk so that their progress could be monitored more closely. Generally, students appeared to be on task.

The teachers, again, had somewhat different approaches toward students' 'socializing' during class. Mr. A set aside five minutes at the end of each class for the express purpose of socializing - conversing and relaxing with other students in order to unwind from the potentially numbing experience of the constant mechanical repetitiveness of typing. Mr. B instructed students to take a break whenever necessary. By mid term he allowed music to be played during class as long as there was no talking, singing along, or getting out of seats.

REVIEW OF TYPING COMPONENT

The difficulties or concerns expressed by the teachers included the problem of teaching touch typing with lettered keyboards. Preferable are the standard classroom typewriter keyboards with blank keys. An attempt was made to cover the keys with small stick-on paper dots, but these were unsuccessful, falling off into the keyboard.

Further, the question of expecting correct posture was complicated by the fact that the typing tables and chairs were not always of ideal size or proportion to allow for such requirements as 'feet flat on the floor'. Such was the case with smaller students.

The program itself, ComputerType, was also somewhat problematic at times, although it reflects a problem inherent to all such programs. If the student begins typing in the wrong column, then every letter that follows will be out of line with the program, and hence, judged as being incorrect.

By the end of the term, teachers and students were growing bored with typing and anxious to move on to word processing. However, the teachers felt that the term had gone well; that teaching typing skills first was a much better approach than trying to teach typing, word processing, and composition all at once. Most students had become capable of touch typing. While students did not always use proper technique, all were using two hands and finding the keys very quickly.

The teachers were working on the need to establish different standards of success/excellence for the Grade 7's and 8's in the typing program, since the present Grade 8's had gained some typing experience in Grade 7. Yet, the teachers did not detect any real difference between the two groups' typing abilities. Individual differences outweighed any apparent difference between the groups.

In September, the teachers had thought that they might introduce word processing some time in November. But they were prepared for the fact that they might not reach word processing until the winter term. They waited to see how students would do with the typing program. They remained determined to ensure that lack of typing skills would not undermine the word processing/composition aspect of the course.

WORD PROCESSING COMPONENT

In January, students spent several weeks learning the word processing program, Superscript, by means of a software tutorial designed by Mr. A. There was no written reference material provided. The Grade 8 classes had experienced Superscript during their Grade 7 year. They were taught somewhat more advanced functions than were the Grade 7 students.

Mr. A felt that the tutorial was quite successful. Students were able to use Superscript easily and were capable of using more functions than he had hoped. Mr. B thought that some written reference material might have been useful. However, he was not disappointed with the outcome. Students at this level generally require a limited number of functions such as formatting commands, insert/delete, transfer of text and, search and replace.

WRITING COMPONENT

Mr. A's Writing Program

Mr. A's writing program reflected his interest in a total expressive language experience approach. On non word processing days, his class worked on story telling skills. They began by discussing ideas of where stories come from, and thinking about the speaking/writing relationship. Mr. A emphasized the point that good stories stem from something 'organic'; they have a natural life to them, and grow in response to real needs.

After the general introduction to the class of these ideas, writing began with an adventure story. Students were instructed to conceive of the story in terms of a beginning, middle and end. They were to write the beginning first, then the end, and finally the middle. Mr. A explained that many professional writers work this way. On the non word processing days students were to tell (not read) their stories to the rest of the class.

The beginnings were to include a description of the setting (Mr. A: "Make pictures for readers to see"), the characters, and an introduction to the main character's problem. Students were encouraged to focus on quality, not quantity, and no particular length was demanded by the teacher. The story itself should determine appropriate length. Although approximately two weeks were devoted to the beginning, students could still return to it at any time for further improvement. In the words of Mr. A, it was a "strive for excellence" approach. The beginnings ranged from 20 to 40 lines in length.

In regard to grammatical details, Mr. A repeatedly emphasized the need for complete sentences. As well, he would pose the following questions to the class: Are sentences in the best place? Are paragraphs in the right order? Do you have unnecessary words? Have you used proper punctuation? Have you used proper spelling? Have you used proper grammar?

Some students would type from a hand written original, others would compose on the screen. Students were actively engaged in the writing task. A number of thesauruses were available to the students and were observed to be used regularly. When students felt they had finished the

beginning segment, they would ask Mr. A to read it on screen. He might suggest changes, but always in a supportive and constructive fashion. While some talking was allowed, if the noise level grew too loud, Mr. A might comment that "the concentration level is slipping".

On the non word processing, 'speaking' days, this same type of support for the language process was evident. Mr. A would attempt to put the speaker at ease by providing a low, comfortable chair for the speaker to sit in. The room was brightened solely by the window light. The audience would be reminded of its role as well, and the need for its concentration on the task. So, there was real attention paid to the relationship between speaker and receiver; they are both necessary for real communication to occur.

With this approach, the writing and speaking components reinforced one another. The non word processing days flowed back into the writing periods. All activities were directed toward the active exploration and development of language skills. In this setting, one was dramatically reminded of the importance of the teacher to the learning process.

The writing product was assessed by Mr. A and self-evaluated by the students. These evaluations were based on both content and structure. For example, the categories of concern relating to the story beginnings included: introduction of character, setting and imagery, as well as word choice, editing, spelling, and correct use of 'a lot', 'there, their, they're', 'to, too', and 'your, you're'. This approach worked well, with Mr. A and the students in close agreement regarding the evaluation. In the end, students had produced a draft of each story section and a final draft of the whole story.

The adventure story was the only writing project completed in Mr. A's class. This was frustrating to Mr. A. However, it was the result of several factors including Mr. A's strive for excellence approach, the late start of the writing component and certain equipment failures late in the year.

Still, it was very successful. Typing skills were maintained to the extent that students were not slowed by lack of expertise. Mr. A felt that the Superscript tutorial had worked very well. Overall, students and teacher shared a commitment to the work. Students, by their own evaluations, appreciated Mr. A's persistence in striving for quality. The majority of students were capable of writing in complete sentences without instruction, merely insistence.

Students enjoyed writing. Some would do editing at home, even though it was not required. Editing involved many surface corrections, but also some text moving. Mr. A observed that the machines tend to remove the writing from the student, depersonalizing the product and thus make it easier for students to envision changes. Most students actually seemed interested in improving their stories. Further, Mr. A. noticed considerable improvement in the writing of lower ability students.

Mr. B's Writing Program

As with Mr. A, Mr. B too focused on quality rather than quantity of product with the emphasis on proofreading and editing skills. Students wrote one story of their choice and completed a number of assigned tasks which included a review (i.e., of a book, restaurant, movie, etc.), an adventure story, and a first or third person narrative.

On non word processing days Mr. B involved his class in a novel study. While Mr. A's interests lay with drama, Mr. B enjoyed exploring literature. He addressed the various components of writing through the study of a text. Thus, the class would cover such topics as dialogue, character and setting within the context of a particular story.

Most students had no problem thinking of what to write about, but Mr. B would hold mini-conferences with students who were experiencing difficulty. The most frequent type of question would relate to specific details necessary for the story, such as, 'what's a name of an exotic island?'.

Mr. B's approach to quality vs quantity of writing involved marking only the first two pages of any product. Students were to edit a first draft themselves and then have a friend or family member read it, before handing it in. The drafts were then marked by Mr. B and students were to complete a second and final draft. Although only two pages were assessed by Mr. B, most students' stories were three to four pages of double-spaced type.

During the first year of this lab program, the teachers had required three drafts of every piece of writing. This year, the approach to drafts was more informal. It had created too much marking time for the teachers to handle.

Mr. B felt the year had been very successful. He, too, found that the typing skills were maintained. He, in fact, retested his groups later in the year to confirm this. Most students were able to type 15 to 20 w.p.m. which seemed fast enough to not impede cognitive flow and was faster than writing by hand.

The writing quality was judged to be excellent. Although, students still needed to be pushed to correct their work. Mr. B suggested that at least half of the Grade 7's and three-quarters of the Grade 8's preferred word processing to handwriting. This is to say that it takes time for students to become accustomed to word processing and appreciative of what it can do. There is also the variable element of individual style to be allowed for.

REVIEW OF PROGRAM

Both teachers were pleased with the writing outcomes of the year. Students seemed to enjoy writing. The quality of work was high. However, this program demonstrated the importance of the teachers' approach to writing and the combination of pedagogical and technological skills needed to operate such a program.

As indicated there were some frustrations. These seemed to stem from three main sources. The first two were inherent to the structure of the program itself. First, the responsibility for the teaching of the English curriculum was divided amongst teachers. Secondly, the time devoted to the writing process was short. However, this was largely due to the first term having been spent on typing skills. And, while it regrettably reduced writing time, it was essential to the perceived success of the writing component.

The third major source of frustration was created by equipment failures. While sporadic failures were accepted and viewed as learning experiences, major or continuing breakdowns served only to frustrate the writing/word processing program. Due to the age of the equipment and its constant use, in conjunction with the absence of dust, heat and humidity control, continuing breakdowns are anticipated in the future.

The situation will be further complicated by the influx of new users (i.e., the other core subject teachers). This year, Mr. A had checked the equipment during a spare period each day. Next year he wo not have the time. Even though a technician is to be available on a regular basis, the teachers suggested the need for spare equipment. But, the potential of this idea is hampered by the present lack of storage shelves.

SUMMARY

1. Regular and frequent scheduling of whole classes in the lab enabled students to gain and maintain typing and word processing skills. It also promoted the real integration of word processing into the English program.

2. Division of the English curriculum between word processing and non word processing teachers frustrated the attempt to achieve a fully integrated program.

3. Given the necessary typing and word processing skills, students were of a sufficient level of cognitive maturity to appreciate such higher order editing capabilities as text moving. Still, the editing process in general was not approached by students with interest equal to that shown toward writing.

4. The milieu created through the lab environment appeared productive and motivational to the task. Student-teacher and student-student interactions were key features of this environment.

5. The lab provided for ongoing task-oriented interaction to occur between teachers and students with the teachers assuming the roles of facilitators and assistants to the task. Teachers could closely monitor tasks and outcomes.

6. A great deal of time, interest and expertise were required of the teachers involved. They were responsible for teaching typing, word processing and writing within the context of the English program, as well as teaching guidance for part of the year. Further, they had to be technically comfortable with and adept at using the equipment.

7. While viewed as beneficial to the writing program, the role played by the technology was secondary to the teachers and their approaches to language experience.

8. A large quantity of equipment and high numbers of users are essential components of an integrated, large scale word processing approach such as this. Yet, as equipment and users increase in number, so too does the potential for equipment difficulties. The need for continual monitoring and maintenance of lab equipment becomes a crucial factor for program success.

CASE NO. 2

Grade:	4, 5 and 6
Number of classes:	1 Grade 4/5 1 Grade 5/6
Number of students:	Average 15-18 per half class
Teachers:	One full-time computer teacher
Location of machines:	One large room (Lab) containing all or most of the machines with a smaller anteroom attached where teacher meets with the class and/or where some machines may be located
Scheduling:	Each Grade 4, 5, and 6 student is scheduled for the computer room for one 30-40 minute period per day. Students are scheduled a half class at a time.
Hardware:	7 Apple 2E - single drives 7 PETs - dual drive microshare system 6 MacIntosh - single drives 5 printers
Software:	Storywriter, PaperClip, Magic Slate, MacPaint, MacWrite, Story Tree

INTRODUCTION

This lab was located in a junior school (JK-6) with a student population of 225. Students were from largely middle class families representing many ethnic backgrounds. A higher proportion were of Greek heritage than of any other group.

As a lab situation, this case shares several features in common with Case No. 1. Both were structured situations in that classes operated on an ongoing, regular schedule with students working simultaneously on prescribed activities. In both cases, there were some

relative novices (Grades 4 and 7, respectively) and groups of students with greater experience (Grades 5, 6, and 8, respectively). Further, they could both be considered 'student-directed' situations, since all students were at computers with the teachers responding to their needs.

This school year was the second year of lab operation. Unlike Case No. 1, word processing was only one component of the overall computer classroom program. The purpose of this lab was to familiarize students with microcomputer applications and develop an appreciation of the computer as a tool. In terms of word processing this meant encouraging students to engage in the process of writing for a purpose. While creative story writing was amongst the activities observed, other applications of writing were also demonstrated.

The teacher wanted to see students involved in 'real writing' for a 'real audience' with the intention of strengthening both the writing process and product. In attempting to gauge the success of the program, the teacher suggested she would be looking for not only the completion of a product but also motivation and enthusiasm in the process. The use of word processing was prevalent during the fall term.

The teacher's computer experience was extensive. She was involved in field testing software and running in-service programs. Thus, her decisions regarding how to proceed in the classroom were influenced by these activities as well as by the needs of her students.

The class used Magic Slate and Story Tree on the Apples and Storywriter or PaperClip on the PETs. Toward the end of the first term, the class received six MacIntosh computers and began by using the MacPaint program as an introduction to the machines, followed by MacWrite. During the winter and spring, the emphasis turned toward the use of graphics, problem solving, animation, data bases, and the integration of software applications. For the purpose of this report, most observations were made during the word processing sessions.

The school had one split Grade 4/5 and one split Grade 5/6. The four computer classes reflected these splits; there was a Grade 4 group, two Grade 5 groups, and one Grade 6 group. Each group had a computer class for 30-40 minutes of each day. Observations focused on one group from each grade level (thus omitting one Grade 5 group). Special education students were integrated into their respective computer class groups.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The space allocated to this program consisted of two rooms: one main room which contained most of the computers and a smaller anteroom which often housed several. A large glass window in the wall that adjoins the rooms allowed the teacher to be aware of activities in both spaces. There was a carpet on the floor of the anteroom where students sometimes sat for an initial introduction to a particular computer activity. In the main room, the computers were located against three walls with an additional table or two jutting into the room if necessary.

Whether or not the space itself seemed adequate in size depended upon the number of students present, and the type of activity occurring.

The furniture was of less than ideal proportions for sustained keyboarding activity, especially for smaller students. Some students would stand from time to time, or kneel on the chairs, since the chairs were low for the table height and keyboards would sit near the chest level of smaller students. With the MacIntoshes, some students rested the keyboard in their laps.

The furniture size combined with the location of machines and disk drives seemed to frustrate the task of copy typing. If the copy was placed next to the machine, on top of a drive, it would sit too high to be easily read. Students might hold it in one hand, prop it against the screen, or place it in their laps.

CLASSROOM MILIEU

As in Case No. 1, the teacher's role in this type of setting was also that of an assistant to the learning process. With younger students and diverse activities, the teacher was in constant demand. This was most evident during introductions of new hardware or software.

It was the kind of environment that required student co-operation. The teacher could not be available to every student for every need. The availability of peer assistance was mandatory, and actively encouraged by the teacher.

In fact, students regularly worked in pairs, sometimes as requested by the teacher, but often of their own choice. This seemed to have a motivational effect on students as well as reduce the demand for teacher assistance. However, when students worked in pairs, they would often sit with the keyboard between them, thus creating an awkward keyboarding position for both.

Students would enter the room with excitement and chatter. It appeared that computer class was approached as a different kind of work than usual; sometimes not as work at all. Student conversation could be heard throughout every class period. But most often it revolved around some aspect of the task. It was a friendly, supportive yet stimulating environment for the students.

TASKS AND OUTCOMES

TYPING

In the fall, some time was spent on keyboarding skills. Students used 'Type Away' on the Pets and 'Typing Tutor 2' on the Apples. The Type Away program was generally the favourite. After a drill, it allows students to form a picture on the screen by using prescribed letters. Typing Tutor is a more standard type of program, i.e., not as entertaining. Most students

using it were more easily distracted from their work, and looked either bored or frustrated. One boy was heard to say, "This is boring on the Apples. I like the PET".

During these drills, students' keyboarding practices ranged from the use of two hands to one finger typing. Most students would have to search for keys. The Grade 6 group seemed more attentive to the home row position than did the others. The teacher attempted to encourage home row positioning and correct fingering with all students throughout the year.

The teacher perceived a difference in students' attitudes towards typing drills between the grades. Generally, the Grade 4's seemed the least interested ('I do not want to do it'), the 5's were a less negative ('Do we have to?'), and the 6's most appreciative of the chance to acquire typing skills ('May I work on typing?').

As previously suggested, when students worked in pairs at a machine, correct typing protocol became more difficult. Students tended to sit with the machine in the middle so that neither student was directly in front of the keyboard. Pairing of students also created a more crowded situation which at times promoted counter-productive social interaction.

Typing was not formally addressed during the remainder of the year. The teacher would encourage students to keep both hands on the keyboard. Occasionally, students would run one of the typing programs by their own choice. Again, this was more the case with Grade 6 students than others. Yet, even though most students continued to use one or two fingers for typing, their facility for finding keys developed greatly. None seemed frustrated by a lack of skill.

TEACHING MACHINE FUNCTIONS - AN EXAMPLE

The teacher was observant of student progress and problems, and was prepared to change her approach/plans in response. For example, early in the year, in an attempt to familiarize students with the insert/delete function, she presented students with a 'game' called 'Minus One, Plus Two' which originated from the Magic Slate workbook. She spent several minutes demonstrating the process, with the students gathered around her in the anteroom. As was often the case, students were allowed to work in pairs if they so desired.

Students began with a three word sentence on the screen, e.g., 'The dog ran', 'The shark attacked'. Using the insert/delete key, students were to delete one of the words and insert two in its place while maintaining proper sentence form. So, 'The dog ran' might become 'The white rabbit ran'. This minus one, plus two' process was to be continued until the sentence contained eight words. There were seven sentences to be completed. The first group (Grade 5) seemed to have difficulty. Often their sentences changed into phrases. Or, they would not delete any words, but would insert several. Students were heard to exclaim 'I'm finished' though none of their sentences contained eight words. (The nature of the task seemed 'product' oriented and students' responses reflected this.)

The teacher acknowledged that the Grade 5's had had problems with the lesson and proceeded to modify her approach with the group of Grade 6's. She spent a longer time demonstrating the

task and suggested that students create six word sentences instead of eight. She also felt that the best sentences had been generated by those students who had worked in pairs, and so this time requested that students work with one or two others. The process ran much more smoothly. (In part due to the fact that these were Grade 6 students.)

With the Grade 4 group, the teacher modified the lesson further. During the demonstration of the game, she realized that this group was having difficulty with the task of maintaining meaningful sentence structure. As well, she was aware that the number of sentences to be completed might be pressuring students to want to finish them all; the result being seven incomplete or poorly done sentences. Thus, she suggested to this group that only one sentence done well would be sufficient. Even with these modifications, this group had problems with the task. The teacher recognized this and said they would work at it again next time.

This example demonstrated a structured approach to the task of learning machine functions; a task that is often addressed in an informal manner. But, more significant was the teacher's behaviour. The lab situation allowed the teacher to be aware of, and immediately responsive to students' needs and abilities.

During this class, as with those that followed, the noise level could be quite high. Students tended to chat with each other regarding the task. As well, the teacher was in steady demand.

APPLIED WRITING TASKS

Early in the fall term, in an attempt to integrate word processing work with the students' regular classroom program, the teacher provided a list of computer activities to the two classroom teachers. They were requested to respond by indicating how these activities might be made relevant to their classroom work. Some of the computer activities included writing haiku poetry using underlining and other typestyles to enhance their work, the structuring of a business letter, writing cinquains using word processing features, journal writing, and the outlining of a science report.

Teachers responded with ideas for the subject matter that might be incorporated into these tasks. So, for example, one classroom was studying 'apples' and the teacher suggested that the haiku poetry might reflect this subject. She further suggested that students write business letters to request information from apple producers.

In terms of the computer classroom program, these activities provided an applied use for writing/word processing. In order to make the activities relevant and helpful to students and teachers alike, the attempt was made to integrate them with regular classroom activities. To support the attempt even further, the computer teacher displayed pictures on the bulletin boards of the subject matter, e.g., apples.

Another activity observed not only involved a practical writing experience, but also linked one type of computer activity with another. The students had been exploring several

problem-solving software programs, such as Dragon's Keep and Snooper Troops. In order to appreciate the capacity of word processing to assist students in report writing, students were requested to write a report summarizing their experiences with the problem-solving software. The teacher had created a file on disk in a report format with a series of incomplete statements for the students to fill in.

STORY WRITING

The foregoing examples illustrate the structured nature of some of the tasks assigned. Less structured use of word processing was also in evidence. Toward mid-year, students began bringing their writing folders with them from their regular classrooms. They used word processing to assist them with various stages of the creative writing process. This included pre-writing activities such as list making, the actual writing itself, and editing the final product. Again, this activity was arranged in conjunction with the regular classroom teachers.

Some students typed from copy, others composed at the keyboard. Students were involved in their own activities. Students seemed keen, self-directed and generally comfortable with the machines and programs. Some students typed in lists of rock stars' or wrestlers' names. The teacher saw this as an example of the list making that is a part of pre-writing, and could lead into the use of data bases and idea processors.

The Grade 4 students required the most assistance; first in loading their stories and later with control functions and saving. This was particularly true for those using PaperClip, more so than Magic Slate. This group also did more copy typing than the others. Yet, they faced the problem referred to earlier: where to put the written copy. Some propped it against the screen, others placed it to the side of the machine. But, there was not enough space to do so comfortably and the furniture itself provided further constraint.

In the spring, students were introduced to Story Tree, a branching adventure story writing program. The introduction of Story Tree was well timed in that the Grade 5/6 teacher had been doing a 'create your own adventure story' unit with the class. But, as with the introduction of any new software, the students had many questions. Thus, the teacher again was required constantly.

The Grade 6 class showed the greatest facility and appreciation of Story Tree. The Grade 4's initially had trouble running the program. It seemed slow: "It's boring". But, as they began to understand how the program worked, excitement grew. They enjoyed the story making process itself. It seemed to stimulate imagination. It was software operation that created difficulties and required assistance. Again, many students worked in pairs.

SPECIAL OUTCOMES

While most computer activities were generated by the computer and/or classroom teacher, toward the end of the year students were initiating and integrating computer work into a variety of projects. Two examples stand out. Students in the Grade 5/6 class had been

assigned novel studies by their classroom teacher. This required students to read a novel of their choice from a collection of 200. Each book contained a card with several questions to be answered regarding the novel story. One of the Grade 6 students decided on his own to bring this work to the computer. This influenced many other students to do the same. This process was very exciting and rewarding for the teachers to see.

The students would often choose to use MacPaint for writing projects in order to incorporate graphics. Students were becoming sophisticated enough in their software experience to consider whether MacPaint or MacWrite was better for their purposes. MacPaint is more difficult to write with since it is not as easy to line up type.

The second example offered to illustrate student-initiated projects was a book of fairy tales produced by the same Grade 5/6 class. The book project itself was initially suggested by the classroom teacher. It is something she has done at the end of every school year. But, the decision to take the work to the computers was again that of the students, and the result was seen as the culmination of the total word processing experience.

The book was produced using Magic Slate, MacWrite and MacPaint and included graphics and hand drawings. It represented a major co-operative effort amongst students. Most of the work was done outside of the regular computer class time. Some composed at the keyboard; others typed from written drafts. Students spent more time perfecting this product than any other. They showed great concern for punctuation and spelling. Co-editing occurred with both peers and teachers.

REVIEW OF PROGRAM

While word processing/writing activities are the focus of this report, many language-based programs operated in this setting. Even within the word processing activities, students were allowed to approach them with flexibility in terms of specific applications, be the lists or editing or composing. This setting might be described as a 'language friendly' environment, recognizing the many ways in which we use words apart from strict 'creative' writing. Rather, it represented the 'creative' use of writing with a word processor.

In terms of the goals of this program, the year was successful. Students experienced a wide variety of software and developed an obvious appreciation for the computer as a tool. During the latter part of the year, when provided a free choice of software, students would tend to choose problem-solving program, adventure programs, graphics and animation programs rather than word processing programs. The activity of writing seemed to require the structure of an objective: a meaningful task to be accomplished.

Yet, when the structure was present, the writing results were exciting. The Grade 5/6 classroom teacher believed that the word processing experience was responsible for improving students' desire to write. The book of fairy tales was seen by all as a grand achievement.

There was less regular communication between the computer teacher and the Grade 4/5 teacher due to the latter's responsibilities and schedule as half-time classroom teacher and half-time librarian. In future, the computer teacher would seek to maintain an ongoing dialogue with the classroom teachers in order to more fully appreciate the needs of each student. She has perceived that some software works best with certain students and was interested in pursuing the idea of individual learning styles within the context of computers.

The teacher was also interested in the students' development of independent problem-solving skills. She tried to encourage students' self-reliance and promoted the idea of peer helpers. But, she recognized the need for students to learn first how to teach, in order to be successful helpers. She posited that students came to her for help, rather than turn to a fellow student, because her instruction was of more value to them; they learned something from it.

The length of each computer class varied from 30 to 40 minutes. That ten minute difference felt substantial. The teacher suggested that a 40 to 45 minute period was preferable. From her experience with after school programs, she felt that a one hour time allotment was ideal. She further suggested that the most exciting results could be obtained with groups of ten or fewer students.

The equipment ran quite smoothly throughout the year. One improvement would be a switching mechanism to allow a printer to be available to every machine. In software, Magic Slate and MacWrite were the most popular word processing programs. They were available for all machines through a licensing arrangement.

There was no grade given for this class. In the teacher's opinion, if one is viewing the computer as a tool, it would be like giving a grade for 'scissors'.

SUMMARY

1. Daily access to the lab enabled students to gain and maintain a number of computer skills including that of word processing using a variety of hardware and software. Students could make informed choices regarding which software best suited a particular task.

2. Often, a minimum of three different software programs would be running on the three types of microcomputers, necessitating a teacher of unusual ability to successfully manage the interplay of students with hardware and software combinations.

3. As with Case No. 1, the lab provided for ongoing task-oriented interaction to occur between the teacher and students with the teacher assuming the role of facilitator to the task. The teacher could be responsive to student needs.

4. The milieu appeared productive and motivational to the task. Further, it variously encouraged and demanded student self-sufficiency and peer co-operation.

5. Ongoing communication between the computer teacher and classroom teachers was necessary in order for word processing activities to be integrated into students' regular school work.

6. The development of keyboarding skills was partially confounded by the combination of furniture and student size. Keyboarding could become more awkward when students worked in pairs. Interest in keyboarding appeared greater with older students.

7. Word processing outcomes were most successful when the task was structured around a goal deemed meaningful by the students.

CASE NO. 3

Grade:	Special education Behavioural Students aged 8-10
Number of students:	7-8 boys
Teachers:	Special education teacher and assistant
Location of machines:	Classroom and Lab
Scheduling:	Flexible
Hardware:	Minimum one Apple 2E in classroom Lab once or more per week 9 Apples - 2E and 2+ 4 printers
Software:	Ready, Set, Read, Storymate, Story Maker

INTRODUCTION

This program was located in a junior school (K-5) with a student population of approximately 300. Again, it was an ethnically mixed middle class population. It is the only site which could be described as suburban.

The teacher had an extensive background with computers and special education. She was involved in the design of software with her board. Of particular interest was the variety of software used for language experience, both reading and writing. This type of program enabled the teacher to be flexible and experimental in her approach to word processing and computer use in general.

Late in the fall, the school organized a lab setup to be in effect two days a week. At the end of each Wednesday, the school's nine computers were grouped together in one empty

classroom for use as a lab situation on Thursdays and Fridays. There was a schedule on the wall in the staffroom where teachers could sign up their classes for a 45-minute period. There were a total of 12 time slots available during the two days. Depending on teachers' interest and other responsibilities, a class had the opportunity for more than one visit to the lab per week. On other days of the week the computers were returned to various classrooms.

Once the lab was established, observational visits were made during the class's computer time there. For two months in the spring, the school had an additional five Apple 2E's which remained in the lab. Through this time, the class visited the lab daily, using a combination of math and language drills in addition to word processing.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The regular classroom itself was spacious. There was an activity table towards the back of the room. Off to one side was a carpeted reading corner. The students' desks sat in two rows of three desks each, facing the front. Two other desks sat separately, one against the front wall adjacent to the teacher's desk and one against the side wall next to the assistant's desk.

The computer was in the front corner of the room by the windows. It sat four or five feet away from the first row of desks. Its location allowed the teacher to easily monitor students' activities in the course of her rounds to all students.

The lab, too, had ample space. The nine computers (Apple 2E's and Apple 2+'s) and four printers were positioned side by side across the front and partially down one side of the classroom. Other than this equipment, the room contained a dozen primary desks and chairs.

Three of the computers were on low computer trolleys built by the principal. The other six machines were on more or less standard typing tables, i.e., with a dropped keyboard surface. Since the school was a one-story building, and both trolleys and typing tables were on wheels, machines were easily transported to and from the lab. The height of the keyboards on these tables still was high for smaller students.

CLASSROOM MILIEU

Due to the nature of this program, the classroom milieu was quite different than that of a lab or regular classroom. Student interaction was allowed in a limited way, that is, appropriate interaction was encouraged, but generally, social behaviour would be an area of difficulty for these students. Thus, there was more behavioural structure to this program than any other.

The teacher appeared to be extremely consistent and fair in her demands of the class. It was apparent that the students liked her and felt comfortable with her. Several of the students had been in her class in previous years.

The original assistant in the class was replaced with another during the winter term. This created an expected amount of flux and interruption to the program. The students had become comfortable with the first assistant. It took some time for students to adjust to the change, and for the new assistant to become familiar with the students and the routines.

Also, this class represented a very wide range of abilities. Some students were at a pre-reading level. As a result, some of the teacher's original computer plans were modified in response to students' needs.

TASKS AND OUTCOMES

TYPING

Once the class had access to the lab situation, some attention was given to keyboarding skills. Each student had received a paper copy of the Apple 2E keyboard. Students practiced keyboard drills at their desks several times a week, instructed by the assistant. At the beginning of each lab session, with Storymate loaded, students would practice finger placement on the computer keyboards for approximately 15 minutes. They worked on standard typing drills as called out by the assistant. A software program to assist this process, 'Kids on Keys', had been ordered but had not yet arrived.

During the first session in the lab, one of the differences between a manual typewriter and the computer keyboard was immediately apparent, though unexpected by the assistant. Her first instruction to the class was to type a line each of the home row keys. On the computer keyboard all this entails is holding down the appropriate key. Upon seeing this, she modified the lesson to 'letter - space ' letter - space'.

Most of the typing technique observed was of the one finger/one hand variety. Even during the keyboarding drill sessions only one student consistently maintained a two-hand home row position. Most of the others appeared to be trying, but needed constant reminders to use both hands and correct fingering. The teacher did not expect the students to attain top typing skills but felt that this process would help to familiarize the students with key location and thus allow them to type faster.

READING - READY, SET, READ

During the fall, the software programs used most often were 'Ready, Set, Read' and 'Storymate'. Both were developed by the teacher's board for use with Apple computers. Ready, Set, Read (RSR) is a Grade 1-2 level reading program, but is 'writing-like' in that the end result is a story that students feel they have created. At the beginning of the program, the student is asked to type in answers to the following questions:

'What is your first name?'
'Are you a boy or a girl?'
'What is the first name of your friend who is a boy?'
'What is the first name of your friend who is a girl?'
'What day of the week is it?'

This is the only part of the program that requires students to type actual words. The rest of the program is operated through the space bar, cursor controls, and certain individual keys.

Once the student has answered the opening question, the screen is filled with nine boxes, each of which contains a labelled graphic drawing of some place, e.g., home, friend's home, police station. There is a small bicycle on the screen in the grid separating the nine boxes from each other. At the bottom of the screen are the directions: 'I' moves bike up, 'M' moves down, 'J' moves bike left, 'K' moves right. The student must move the bike into a chosen box which will then become the location around which the story develops.

Once done, the nine pictures dissolve and one large graphic appears depicting the location. At the bottom of the screen are several statements from which the student chooses one. The story line then branches based upon this choice. Another picture emerges with more statements to choose from and so on.

The initial information that the student typed in, i.e., gender, names and date are included within the statements provided. Thus, the story line is personalized for each student. Even though the major activity of RSR is reading, the program allowed students to feel actively involved in the story writing process.

The stories were then printed out. The program provides that the top half of the page remain blank but bordered to enclose a picture that the student would draw.

While students felt they had freely created their own stories, RSR is actually a tightly structured activity. Students are provided choice within a very limited framework. The program is simple to operate, requiring the use of few keys. The length of time necessary to complete a story depends upon the student, but it could be done in as little as three or four minutes. The end result, the printout, was there immediately for the student to read aloud to the teacher and illustrate.

Students appeared to really enjoy the RSR process. The students who were in the classroom last year were very comfortable with it. It was one of these students who was able to finish in several minutes. Yet, even he showed visible signs of pleasure as his story took shape.

One of the students who was virtually a non-reader still was able to work through an RSR story with minimal assistance. He had no problem reading the opening questions, having had enough experience with the program to know what they said. But, he did have trouble spelling the answers correctly. The program will only accept correct spelling of the days of the week.

Once into the story-making process, he would run his finger under the words on the screen in an attempt to read them aloud.

The students with the lowest reading abilities showed real delight and pride upon completing a story. RSR allows them to feel accomplishment. These are students who otherwise would need to dictate their ideas for the teacher to write out. Their written story length would be one or two sentences.

WRITING - STORYMATE

Storymate is the word processing component of the board's 'Ready, Set, Write' program which is in the final stages of development. It is a basic word processing program along the lines of Storywriter.

Storymate was introduced to the class during the first lab session. Students did their keyboard drills with it. It was not spoken of as 'word processing'. Students were simply told that they would be writing on the computer instead of on paper. In fact, the first time they wrote with Storymate, the teacher said: 'Imagine that it's two o'clock and you're not writing on a computer. You're writing in your journal'. Students then spent ten minutes trying to compose journal entries. Most had one-half to one line completed. For the remaining five minutes of class time, the teacher had them play with the cursor controls.

The first visit to the lab was the most unstructured. Following visits demonstrated a methodical approach to the use of word processing with these students. In all cases there were definite pre-writing activities to provide students with ideas for their writing. Even then, most students had difficulty writing. At the end of a 20-30 minute writing session students might have three to five lines written. But, with paper and pencil the teacher knew that there would be far less produced. There was no copy typing done at the computers, only composition.

WRITING - STORY MAKER

During the winter and spring, much use was made of the program Story Maker. This program would not print out: it was strictly an on-screen experience. Nonetheless, students enjoyed it immensely. It allows students to write a story and create a picture on the screen to accompany it. All of the stories saved can be retrieved together, so that one can see all stories written. Or each story can be retrieved with its accompanying graphic. The graphics component added another dimension to the story writing process and provided the lower ability students with a manageable and enjoyable task apart from writing.

For the remainder of the year, students composed with both Storymate and Story Maker. The teacher demanded more of the students, based on the ability of each. She focused on correct sentence completion: inclusion of subject and verb, recognition of the sentence end, placement of periods and capitals. She demanded that stories consist of a minimum of two correct sentences. Spelling might be corrected during final editing, but was not the focus of concern.

The lower ability students had difficulty meeting these criteria, and would be offered assistance. If necessary, the teacher or assistant would transcribe their stories. Generally, the other students would write from two to five sentences, which would equal four to seven lines. One story had grown to thirteen lines. While editing it on the computer, this student added a line at the bottom. Additions to previously written work were seldom seen.

Students were most successful with the writing process when the task was well defined through pre-writing activities.

REVIEW OF PROGRAM

The teacher felt that the progress of this class was slower than that of the previous year. Part of this was due to the fact that this year she did not take the class to the board's computer centre for weekly sessions. Because the class included students at the pre-reading and writing levels she felt that such an activity would not be beneficial for all. She altered the plans and program to adapt to her students' needs.

The teacher believed that word processing was helpful to both the reading and writing skills of other students; that it encouraged them to take more chances with language use. They were more willing to try creative spellings and more motivated to write generally. The teacher felt that word processing pushed the lower end students beyond their real capabilities, but that the motivational factor of the machines led students to work harder.

The lab setup worked well. The teacher enjoyed both the lab and the computer in the classroom. She did notice that having more than one student work at the computers at one time appeared to encourage time on task. Even highly distractable students were able to persevere.

As with the other cases, the word processing/writing component of this case was a part of a much larger language program. Toward the end of the year, students did more workbook writing in conjunction with their reading program. Yet, the teacher felt that even here, spelling, punctuation, and sentence form and length had improved, due in part to the word processing/language activities on the computer.

She commented that her students, while preferring to write with the computer, still did not like to correct their work. She offered this as an explanation to the observation that students repeatedly asked how to spell words as they wrote. It was not so much that they did not like to make mistakes, in and of themselves, but that they did not want to have to go over their work again. They wanted it to be 'done' the first time.

In future, the teacher would spend more time on keyboarding skills. She felt the time they had spent was beneficial, prompting students to keep both hands on the keyboard. By the end of the year, students had no trouble finding keys, using one or two fingers to type. Most students were comfortable handling all of the equipment.

The teacher concluded that word processing is a valuable language tool that enhances the writing task. It was her experience that the poor student would write at least as much on the computer as they would by hand. The interested student would write more.

SUMMARY

1. Whether in the classroom or the lab, students in this program had regular access to the computers due to the small class size.

2. Regular computer access allowed for the integration of a variety of language-oriented software based on the individual needs of each student.

3. In the lab, the teacher and assistant were able to closely monitor the students' progress.

4. Keyboarding skills were formally addressed and viewed as a worthwhile endeavour.

5. Structuring of the writing task through specific pre-writing activities was viewed as integral to the success of the writing outcome.

6. Students who would otherwise have great difficulty remaining on task were able to do so at the computers. Thus, students wrote more than they would by hand.

7. Exposure to language activities at the computer appeared to have positive effects on non-computer language work.

8. Motivational effects and co-operative behaviour were exhibited in the lab environment.

CASE NO. 4

Grade:	Primary Intensive Literacy group
Number of students:	8
Teachers:	Resource Teacher
Location of machines:	Resource Room
Scheduling:	The primary intensive literacy group was seen from 9:00-10:30 each morning.
Hardware:	2 PETs - dual drive 9 C64's - single drives 1 printer
Software:	Storywriter, PaperClip

INTRODUCTION

This case and Case No. 5 shared the same classroom and teacher. The setting was located in a junior and senior school (JK-8) with a population of 600 students. The school population represented a more upper middle class, Anglo-Saxon background than that of the other cases. However, the students in the programs observed reflected a range of socio-economic and ethnic backgrounds.

This classroom represented a specialized program setting with a large number of microcomputers. Students used the microcomputers extensively for writing with the word processor. This included both journal writing and creative writing. Language skills were the major focus of this program. No special attention was given to typing skills beyond encouraging the use of two hands.

The teacher had extensive knowledge and experience both with computers and students with special literacy needs. According to the teacher, these students felt positive about being in a program with access to so many computers. It gave them enhanced status within their peer groups.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The classroom was a crowded one. Being a resource room, it served many needs. The front of the room contained a dozen or so desks and chairs with the teacher's desk off to one side. The back half of the room was taken up with a library corner, an activity table, and the computers. The ten computers were placed in an "L" formation, three along the wall and six (three pairs back to back) jutting out from it, with one at the end of this arm.

The desks that held the computers were too high (or the chairs too low), for the younger students. Students sometimes knelt on the chairs or stood up to compensate.

CLASSROOM MILIEU

The atmosphere of the classroom was relaxed. The students interacted easily with the teacher. Again, because it was not a regular classroom setup or program, the teacher/student rapport was less structured. The teacher herself acted more as a 'resource' than as an authority figure. It was clearly a student-paced learning environment. Students worked on individualized programs. The teacher was in demand, answering questions and checking work. It appeared that the greatest concentration of teacher/student interaction occurred at the computers.

PRIMARY INTENSIVE LITERACY PROGRAM

This special program operated from 9:00 to 10:30 each morning. It consisted of seven Grade 2 students and one from Grade 3, with equal numbers of boys and girls. The Grade 3 student had had experience with computers in this same program the previous year. In fact, all of the students had had some previous exposure to computers in their classrooms.

Students spent the first few weeks of the year learning basic computer functions and care, such as how to turn the machines on and off, how to put in a disk and load, and the names of the various pieces of equipment. The teacher suggested a simple mnemonic device for remembering the proper sequence with which to turn on the equipment: Do not (Disk) Play (Printer) with My (Monitor) 'Computer'.

The students used Storywriter during the fall term, except for the Grade 3 student who used PaperClip. He had had prior experience with this program and still had those earlier stories saved on disk.

TASKS AND OUTCOMES

TYPING

The teacher encouraged students to keep both hands on the keyboard and use them appropriately for the right and left sides, even if it was only with one finger on each hand. Some of this behaviour was observed, but the majority used one finger of one hand most of the time.

Students' ability to locate keys improved, but typing remained a slow process. However, students rarely seemed bothered by this. Students tended to use the delete function to return to an error, rather than cursor back.

It was not always easy to know if errors occurred due to language or machine difficulties. In one example, the student made an understandable error in her assumptions of the keyboard. With the correct spelling of 'Santa Claus' to refer to, she instead typed 'Santa Ciaus'. She apparently mistook the capital 'I' on the keyboard for a lower case 'l'. Yet, she continued to use this incorrect version several times over. Even, then, while reading from the screen she ignored the misspelling.

JOURNAL WRITING

During the fall, while students were becoming more accustomed to the equipment, most daily journal writing was done first by hand and then typed on the computer. Inventive spellings were encouraged by the teacher. Students were told not to worry about spelling but to write words as they sounded. However, students were not always comfortable with this, and would ask the teacher or another student for correct spellings.

Students would read their journal entry to the teacher, then type it on the computer. Generally, journal writing was not corrected in any way. It was seen as an opportunity for students to use language and express their thoughts without criticism. The teacher then had the student read it again from the screen. Sometimes, spelling and punctuation would be corrected. The text was then saved on disk.

STORY WRITING

Often, story writing would be stimulated by discussion of a particular topic. Students might write about their weekend activities or other personal topics. A film might be shown, followed by discussion and writing. There was often an ongoing theme being examined. The theme of friendship was approached in various ways throughout the year. Another topic explored was that of outer space. Stories would reflect whatever theme was current.

The following is an example of the kind of writing observed early in the year. This was composed at the computer. It took the student approximately ten minutes to compose, typing with one finger and having some trouble locating the keys. The text read:

i wod lik ti be piesmani wod lik ti be a bas.

When the teacher had him read this aloud, it read:

I would like to be a policeman. I would like to be a boss.

The teacher helped him to correct it to this form.

Students spent anywhere from ten to 45 minutes at the computers. Most averaged 30 minutes. As the first term progressed, more composing was done at the computers and more time was spent at them. This included journal writing and story writing. Story length seemed to average three or four lines. This might take 30 or 40 minutes to compose.

A ten minute student sample of writing read:

i wit to the zoo wistrday and i soo a moce and vay wor payinen hitandgo and. soo agoraf, s esting fod and i soo a....

meaning:

I went to the zoo yesterday and I saw a monkey and they were playing hide and go seek. And I saw a giraffe, he was eating food and I saw a....

Students were writing with Storywriter in their regular classrooms as well. All students became proficient at loading and saving their Storywriter work. Four of the students were using PaperClip by the end of the year.

PEER INTERACTION

Students enjoyed the computers and usually appeared to be on task. Conversation between students most often revolved around computer use or writing. Students would ask each other for help with spelling or with saving their stories, or just talk about what they were writing. Students might look at what their neighbour was writing on the screen, though students seemed most interested in their own work. Students offered to help each other quite readily. Two of the most adept students became very good at helping.

Students composing at the computer might copy from each other. In one instance, two neighbouring students had both begun their writing with: 'On Monday we..'. The teacher noticed this and remarked: 'You're not copying each other are you?'. After 30 minutes the two stories read:

1) On Monday we want to the stox and we boought it, then we want back to the school.

2) On Mondaday we bought a pampkin we all like it. On Tusday we cooked the pampkinseeds.

These students were encouraged to lengthen their stories. The teacher asked them 'what else did we do?' 'what did we do before cooking the seeds?'. But the two did not add more lines. After five minutes, each proceeded to type 'The End'.

SPECIAL OUTCOMES

One of the highlights of the year was the creation of a book by each student which was followed by a public reading at an 'authors' party. These laminated books consisted of seven to ten short stories on a theme, illustrated by the authors. Each concluded with a page of photographs and information 'about the author' (composed by the author) and a final blank page inviting readers' comments.

The photographs included pictures of the students writing at the computers. Students had captioned them with statements such as 'I like writing and reading', or 'I love the computer'.

These story books took several weeks to create. The teacher at times doubted whether the work involved was worth it. But, in the end, she and the students were thrilled with the outcome. The students were 'a mile high' for days following the public reading which students' families, and board and school personnel attended.

Following the public reading, students sent letters of thank-you to those who had attended. One teacher responded with a letter herself, which prompted students to send another to her.

REVIEW OF PROGRAM

The tasks in this student-paced program appeared more open-ended than those of some other programs. Yet, structure existed in the daily application of word processing to the journal and story writing processes. The ability to compose at the keyboard took time to develop. At times, the keyboard and the word processing programs seemed to slow students down.

The teacher was impressed with the gains made by the students and feels that the computers were a major contributing factor. Students wanted to write. They stayed on task and persevered well beyond the point at which they would have given up if writing by hand.

Student interaction and co-operation were promoted. The reading of each other's work was a regular occurrence. The teacher felt that students' reading improved through the amount of on-screen reading that was done. Further, there seemed to be a motivational effect resulting from the group work.

SUMMARY

1. The large number of computers in the classroom enabled every student to write stories daily.

2. With all students writing at the computers simultaneously, the teacher could attend to task-oriented concerns.

3. Students were very comfortable with the daily computer writing activity, handling the load and save operations easily.

4. Co-operative behaviour was fostered and students showed an interest in each other's work.

5. Keyboarding skills were not formally addressed, but generally students did not seem frustrated by lack of skill.

6. As with Case No. 3, these students could often experience difficulty remaining on task, but were capable of much perseverance with the computer. They appeared to enjoy the writing process.

CASE NO. 5

Grade:	Senior Resource group
Number of Students:	12
Teacher:	Resource Teacher
Location of Machines:	Resource Room
Scheduling:	Every afternoon
Hardware:	2 PETs - dual drive 9 C64's - single drives 1 printer
Software:	PaperClip

For introductory comments and a description of the physical setting and classroom milieu, refer to Case No. 4.

SENIOR RESOURCE GROUP

The year began with ten students, but two more were soon added. This meant that there was no longer one computer for every student. Approximately half of the class had had previous experience with PaperClip. Each student had a disk which was kept in the classroom in the disk file holder.

TASKS AND OUTCOMES

JOURNAL WRITING

From the beginning of the year, students composed their daily journal entries at the computer. They would begin by formatting the text with the proper commands. Some discussion might develop regarding formatting and the choice of which screen colour for text and background might be used.

As observed in other programs, some who could not think of what to write might begin by copying from a neighbour. The length of time it took for actual writing to begin decreased as the term progressed. Initially, it might take students ten minutes. By mid year, for most there were no delays.

Since the journal is an individual's account of feelings, events and personal reflections, it can include private information that is made public on the screen. Whether the public

nature of on-screen journal writing might inhibit personal expression, or conversely, provide a forum for personal exchange, is open to speculation at this time.

STORY WRITING

As with the students of Case No. 4, students in this program wrote stories stimulated by ongoing theme discussions. Stories were written on the topic of friendship and outer space, to name two of the major themes of the year. Students at this level appeared to require fewer and less structured pre-writing activities to stimulate the writing process. They could generally think of many things to write about.

Most students, while not touch typists, used both hands and found the keys quickly. Because they were not copy typing, they could freely attend to the keyboard and the screen. Students would converse with each other, but a generally quiet working environment prevailed. Students were comfortable with the equipment and the activity of on-screen composing.

The teacher spent most of her time with the students at the computers. While others were at their desks finishing spelling assignments or other work, the teacher's attention was drawn to those at the computers. Whether it was to solve a problem, or to help edit a student's writing, the most intense teacher/student interaction seemed to surround the computer and its product.

Student questions might relate to PaperClip's control functions, e.g., how to move text. Some students might ask how to spell a word. During observations, however, neither students nor teacher directly discussed the larger issues of content flow or organization of ideas.

There was wide variability in the amount of writing accomplished. With this group the result seemed governed more by the individual's writing abilities and distractability level than by machine or keyboard difficulties.

Due to the maturity of these students and their adeptness with the computer and word processor, the writing flowed much more easily than for younger students. There of course were large individual differences, but, to look at word processing and the writing program was a more difficult task. These students were not bound by the external constraints faced by younger students.

The students appeared on task. The teacher felt that they would not have accomplished as much without the computers.

EDITING

The teacher attempted to encourage peer editing by requiring that stories be read by two students before being shown to her. While this process promoted co-operation and served as another form of language experience for the students, the potential for actual corrections to be made was necessarily dependent upon the language abilities of the reader. So, errors might

go undetected. Or, one error might be replaced with another, as in the misspelling of a word. Or, new errors would be created by the reader, believing them to be correct.

The teacher would then edit stories with each student by sitting in front of the keyboard with the student next to her, and the story on the screen. She would read the story aloud, moving the cursor line by line through the story, stopping it when she arrived at an error in spelling or punctuation. She would ask the student to identify the error. If the student was unable to do so, the teacher would specify it and make the correction.

REVIEW OF PROGRAM

The teacher was very impressed with the gains made by these students and would suggest that the computers had a large impact. As well as improved writing skills, she felt reading was improved both through the use of the software manuals and from students reading and re-reading their own and others' stories on screen. She perceived that students seemed more able to identify errors on screen than on paper. Further, she suggested that student conferencing and peer editing would be impossible with hand written work: it would be too difficult to follow.

Students who would not write on paper were interested in the computers. As well, easily distractable students would remain on task to a greater extent. Stories were longer. Students would return to old stories and make additions to them. Students no longer asked 'How long should this story be?' as they would with handwritten work. Students seemed less resistant to the editing process.

While pleased with the students' progress, the teacher found that running this program took more time than she had anticipated. She felt this was largely due to having only one printer linked to one machine, which slowed down the whole process. The greater the number and longer in length the stories became, the more printing time was needed. At the beginning of the year, the teacher printed every draft, but by the end was printing final drafts only.

SUMMARY

1. The large number of computers in the classroom provided a lab-like situation which enabled every student to write stories daily.

2. Computer writing was a major feature of this program with the teacher steadily engaged in task-oriented interaction with the students.

3. While keyboarding skills were not formally addressed, students developed their own styles and were generally able to find keys quickly. They became adept at handling the equipment and software. The technology did not appear to interfere with the writing process.

4. Students helped each other. While co-operative behaviour was encouraged through the process of peer editing, some of the difficulties inherent in this were evident.

5. It was perceived that students would remain on the writing task longer with the computers than with paper and pen. Students seemed interested in writing.

CASE NO. 6

Grade:	Split 2/3
Number of students:	27
Teacher:	Classroom teacher
Location of machines:	Classroom
Scheduling:	Each student edited one story per week at the word processor in sessions of 30-45 minutes.
Hardware:	5 C64's - single drives 1 printer
Software:	Storywriter

INTRODUCTION

This case was located in a junior school (JK-6) with a population of 200 students. It was in a working class area reflecting a mixture of ethnic backgrounds. The predominant heritages were Greek and Italian.

This case represented the only regular primary level class to be studied. During the previous year, the teacher had operated an intensive literacy program with 15 students and one computer in the classroom. Extensive use had been made of the computer for word processing. This past year, with a full Grade 2/3 class and five computers, she again attempted to integrate word processing into the language program. Her own computer experience was minimal.

Students wrote with Storywriter. Speedscript and Printshop were available, however, they would not function with the printer, so were not used.

Students wrote a story every day, with or without the word processor. One story per week was edited and printed on the computer. Stories were saved on disk for the teacher to print. Students would make covers for the stories which would become part of the classroom library.

This Grade 2/3 program faced some problems in the early fall. The teacher did not have her class complement finalized for several weeks. Secondly, there were equipment problems. Only two of the five microcomputers in the classroom could be operated due to a shortage of electrical outlets and a lack of powerbars to compensate.

The teacher purchased the powerbars herself (to be reimbursed later by the board). However, it was then discovered that two of the machines still would not work. She expressed much frustration at the time, arguing that teachers should not be expected to solve such problems; that generally they do not have the expertise, and certainly they do not have the time. It was a month before the classroom and computers were functioning in a relatively smooth fashion. One of the computers continued to behave 'temperamentally' throughout the year, and power packs needed replacing several times.

The teacher assigned students randomly to reading groups, i.e., each group reflected a range of reading abilities. On average, five students comprised each group. Scheduling of the microcomputers was arranged according to reading group. One of these reading groups was the focus of observations. It was a group of Grade 3 students consisting of three boys and two girls of average to high ability.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The classroom was of standard size. Initially, the students' desks were arranged in groupings of four to eight. Desks were then rearranged into rows of single desks. The teacher explained that the noise level had been too difficult to control with the former arrangement. Later in the year, desks were again grouped. At the front of the room was a reading centre.

The computers were at the back of the room. Originally, three of them faced the back of the room, while two, back to back with these, faced the front. When the classroom seating arrangement was first changed, the computers were moved into one long row across the back of the room, facing the back. They sat on desks, i.e., not typing tables. Instructions for loading programs sat next to each machine on top of the disk drives.

The room was crowded with furnishings. The computers somewhat obstructed access to the cloakroom. The cords and powerbars contributed further to a feeling of physical disorder. The teacher was well aware of the room's restrictions. Having the computers meant that space for other activity centres suffered. She felt that a larger room would be necessary to operate the optimal classroom program.

CLASSROOM MILIEU

In the classroom, students were on individualized programs. They would work at their desks. If they had questions regarding the work, or if their work was ready to be checked, they would line up at the teacher's desk. There were always several students waiting to speak with the teacher. Since the teacher interacted with students on a one to one basis, those at the computers were not distracted by class activities.

Students using the computers appeared to remain on task and enjoy it. They largely relied on each other for assistance. There would always be some amount of conversation amongst them,

but it would revolve around the computers and the task. A certain amount of 'playing' with the machines was common.

TASKS AND OUTCOMES

WRITING AND EDITING

All students wrote stories every afternoon. A variety of pre-writing activities were employed. Often students' stories would originate from one of a series of 'story starters'. This might consist of a number of incomplete sentences following a certain story line. Or, it might be a brief introduction to a particular situation, intended to stimulate the student's imagination. A large number and many types of story starters were available. Students always seemed able to find one they liked.

The teacher's original plan had been to have one group of students enter and edit a previously written story of their choice on the computer following morning recess. Another group would have the opportunity to compose at the computer during the afternoon writing time. Thus, the plan involved providing each student with two opportunities per week to work with Storywriter: one to compose at the computer and one for editing purposes. The time provided for either activity was to be 30 to 45 minutes.

The story chosen for editing could be any story from the student's story folder, whether or not it had been composed on the computer. However, students took more time to type their stories in the morning than the teacher had planned. Hence, more often than not, the students who had begun at the computers in the morning would need time during the afternoon writing period to complete their editing work. Students did little composing at the computers during the first term. Thus the focus of observations was the morning editing time. Students were at the computers for as long as 60 minutes.

The process termed 'editing' should be clarified. As previously stated, students chose one story weekly to be entered into the computer with Storywriter, corrected and printed out. In the beginning, the teacher first checked the handwritten copy and indicated corrections of grammar and spelling. Once the story was typed into the computer, the teacher would check on the screen for any remaining errors. The story would be saved and printed out. The student would then design a cover for the story and it would become a part of the classroom library.

After a month or so, the teacher stopped checking the handwritten versions and only corrected errors on the screen before the story was printed out. Students were encouraged to check their work carefully for errors before having the teacher look at it. The decision of the teacher to stop double-checking students' work was based largely on time constraints.

COPY TYPING

Through observing the editing process, several issues emerged. First, to an adult observer, the lack of keyboarding/typing ability was obvious. Students typed with one finger

of one hand, usually the pointer finger of the right hand. Some used the left hand to manipulate the space bar or shift key. They always looked at the keyboard to find the appropriate key. It was a slow process.

The issue of typing skills was further complicated by the copy typing activity in which these students were involved. Not only did they need to look at the keyboard, but also refer to their written copy before proceeding. Thus, students looked at their story, then at the keyboard, then at the screen to confirm that they had actually typed what was intended.

The typed versions of the stories were usually accurate copies of the written work. But, several times it was observed that students had omitted a number of words or created other new errors through the transposing process: a problem not uncommon to even seasoned copy typists. That students did not detect these omissions suggests that they were not rereading their story on screen with any degree of care before the teacher checked their work.

For example, one student's story included the word 'doctor' several times. In the handwritten version, the word was spelled correctly in every instance. On the computer, it appeared as 'docter', docer', and 'dockor'. This student remarked, "I'm getting mixed up here", referring to the difficulty of typing from copy. He said he would rather memorize his story and type it without the paper copy. He concluded by saying that he would not write such long stories anymore (this one was eight handwritten pages) because it took too long to type them. When students typed on every line, as some did, the text was more difficult to read.

Further evidence of the observation that these students were not attending to, or did not perceive their errors occured during the time when the teacher was still correcting the original handwritten stories. Students then, more often than not, copy typed their original errors, even though the teacher had made corrections for them. This was further motivation for the teacher to abandon the initial correction process in favour of one final check on screen.

The typing process and, in particular, the copy typing process were made more difficult by the lack of appropriate furnishings. As mentioned, the computers sat on desks, not on typing tables. As it was, these desks were at a relatively high level for the size of student. The keyboards sat at students' chest level. Thus, their arms were raised above what seemed a comfortable height for prolonged two hand typing.

Further, the possibility of two hand typing was discouraged by the fact that there was no suitable place for students to rest their written copy where it could remain in easy view. Students would lay it on top of the disk drive, but because of the height, students would have to strain to see it. At other times, students would type holding their copy in one hand, resting the copy in their laps, or propping the copy against the lower part of the screen at the top of the keyboard. None of these arrangements seemed satisfactory, and students would frequently change the position of the copy throughout their time at the computer.

The teacher was aware of this problem and did attempt a remedy. She thought that if the students could attach their work to a rigid backing, then at least it could be propped against

the screen without slipping down. She provided cardboard and paperclips for this purpose. One student was observed attempting to use the backing. He clipped his story to it and propped it above the keyboard, but it covered the bottom half of the screen and he ended up holding it on one hand. Students generally chose not to use the cardboard.

While the above observations may appear problematic to the adult observer, students in this program did not express negative feelings about the process. While they acknowledged that they might like to type faster, generally they did not appear to be frustrated by lack of speed.

It seemed that the copy typing process was the biggest factor in limiting students' speed. As the term proceeded, students did gain familiarity with the keyboard, so despite the fact that they typed with one finger, keys were located quite quickly. However, the continual checking of the handwritten copy, coupled with the aforementioned problems of copy location, seemed to be key factors in slowing down the process.

Predictably, students' expertise with the word processing program, Storywriter, improved throughout the course of the year. By the end of the first term, most students were able to load and save. It appeared that the greatest difficulty surrounded the use of the 'insert' key. If letters or words have been omitted, one must use the insert key which requires the use of the 'shift' key, in order to create spaces within the text. The same key, if not shifted, acts as the 'delete' key. This key is marked 'INST/DEL'. Students in several of the programs observed were heard to refer to this key as the 'instant delete' key - which is exactly what it is if the shift key is not used.

Rather than use the insert capability, students were observed deleting their work back to the point where changes were needed. While this process creates extra effort, it is also only feasible within a copy typing situation where the deleted text still exists in the handwritten version. Students gained facility with the use of the insert key, but deletions of text still occurred. It just may seem the simpler thing to do, given the copy typing situation.

COMPOSING

As students' keyboard familiarity grew, their copy typing speed improved. Thus, later in the year, the afternoon computer writing period became a more regular feature. Students indicated that they enjoyed it, preferring it to copy typing. They typed much faster during the composing sessions, compared to copy typing. Most preferred composing at the machine to hand writing, but one student disagreed, saying that she would rather write than have to look for the right key.

Less time was spent observing the composing process than copy typing. Initially, stories composed at the computer often seemed longer than the hand written ones, though not always 'better'. However, by the end of the year, stories seemed shorter. Students did not seem as engaged in the task. The teacher wondered whether this was due to the approaching school year end, or if it was a type of 'burn-out' from so much writing.

STORY LENGTH

When stories were not composed on the computer, a discussion of story length does not bear directly on the issue of the impact of word processing on the writing process. An examination of number of lines typed in the specified amount of time mostly relates to copy typing abilities and ease of machine use, not to flow of thought processes. Likewise, an examination of completed story length, while obviously reflecting the writing process, does not relate to the computer. And, because only one out of five stories on average was chosen for word processing, this represented a limited sample of students' written work. (On more than one occasion students had chosen to type from booklets they had made that consisted largely of drawings with minimal text attached.) Thus, the meaning of the word processing product in this context is ambiguous.

As mentioned, although students were instructed to carefully check their work for errors, most errors remained untouched until the teacher pointed them out. Corrections offered were at the level of spelling, grammar and punctuation. No revisions of content or structure were observed.

The teacher believed that the major factor determining story length was the degree of student interest in the topic. Some topics are more motivating than others. She used a variety of prewriting activities to help stimulate story development. She believed that children of this age need ideas, or at least the stimulation to create ideas; that if one just said "write a story", very little would result.

With these points in mind, it was observed that story length of word processed stories generally ranged from seven to 15 typed lines for the duration of the fall term. The most prolific writer of the group was producing stories in the range of 20 to 25 lines. This student was the only one observed to also include additional text at the end of one of his stories that had not been a part of his original copy. By the end of the year many stories were 15 to 25 lines.

PEER INTERACTION

While students at the computers appeared to be on task and interested in their work, there were social aspects of both a co-operative and competitive nature. Students helped each other to load or save, for example. If there was a problem that none of the group members could resolve, any one of several resident computer 'experts' was pleased to assist. More noticeable, however, was the competitive aspect of students comparing the number of lines they had typed at any given moment, and ultimately comparing the final length of their stories.

In one instance, there was a solitary student working at the computer, who was not joined by any others for ten minutes or so. His progress, while alone, was very slow. He appeared somewhat distracted by other students' nearby activities. After ten minutes, he had typed three lines. At this point, another student joined in at the next computer. Within five

minutes, both students were typing on line four and the statement "I'm on my fourth line" was voiced by the second student (who generally appeared to be the most adept student of the group).

The conversation later continued with the second: "I'm on my second page. I'm almost finished."

Responded the first, "Yeah, because your story's so short. Look how far I am. I'm on my seventh line."

He moved over to the second's machine and counted the lines. They debated who had typed more. There was some confusion due to the students leaving some lines blank. They had actually typed about the same amount.

This type of conversation was a common occurrence. What was particularly interesting about this specific incident was the observation that the first student was much more attentive to the task and worked more quickly after the arrival of the second student. There appeared to be a motivational impact. As alluded to, the second student was bright and able with the computer, and as well it appeared that he was liked by other students.

Student conversation in general surrounded some aspect of the task. Students compared lines typed, asked each other for assistance, or shared some knowledge about computer functioning. Once students had completed typing and saving their stories, they were often observed playing with the cursors, exploring together, for example, the file length or the difference between the functions of the cursor controls and the return key.

REVIEW OF PROGRAM

As noted, students appeared interested and motivated to use word processing. One student remarked that she liked using the computers "because then you do not have to do your work", implying that the computer was viewed as something other than 'work'. It seemed to be enjoyed by students. Another, actually the prolific writer, when first asked whether he would rather compose at the computer than copy, replied that he thought it would be harder to compose at the keyboard; that it takes time to think of what to say and it would be easier to write it out first. In the end students composing at the computer were enjoying the activity. The teacher felt they were writing longer stories, though not always 'better' stories. In future, the teacher would hope to have students do more composing at the computers.

Although the term began with some frustrations, by the end the teacher felt her program was really taking shape as intended. The students were more able to handle the equipment without her help and scheduling of classroom activities, including word processing, had become routine. Students were more self-sufficient.

If she were to do it again, the teacher would plan to instruct one group at a time to learn the basic computer/word processing functions while other students were out of the room,

eg., in French or music class. She felt that if computers were introduced in Kindergarten or Grade 1, this hurdle would not present itself to such a degree.

She once thought the best setup would be a lab situation with classes scheduled for use and classroom teachers responsible for its operation. As mentioned earlier, she had found that the amount of space needed for five computers had crowded her classroom so that her other activity centres had suffered. In the end, she decided that having the computers in the class was best, but required a larger room.

She was pleased with the interest her students showed in writing. Several students asked to take paper home for writing purposes. This was a 'first' in the teacher's experience. The idea of home writing gained momentum after one of her students wrote a 'book' at home and brought it in to type on the computer. The book consisted of ten chapters of six or seven typed lines each.

The teacher also thought that the computer encouraged students to read each other's stories and observations confirmed this. She thought that students' reading had improved as a result.

SUMMARY

1. Students were afforded relatively limited access to word processing largely due to the number of computers and the realities of operating a regular primary classroom.

2. Word processing was used extensively for copy typing. The process in itself appeared laborious. It was aggravated by the lack of both keyboarding skills and furnishings conducive to such an activity.

3. The composing process appeared easier than that of copy typing. However, with or without the computer, the writing process was limited by the students' relative cognitive immaturity. Thus, higher order editing functions were not observed.

4. Students engaged in both co-operative and competitive behaviour. The competition appeared motivational to the word processing task.

5. A variety of pre-writing activities were used to structure the story writing task. They were viewed as essential for students of this age.

CASE NO. 7

Grade:	6
Number of students:	28
Teacher:	Classroom teacher
Location of machines:	Classroom
Scheduling:	Each student for 1/2 day per week
Hardware:	1 PET 3 C64's 2 printers
Software:	Storywriter, Bank Street Writer, PaperClip

INTRODUCTION

This last case provided an example of a regular junior program with computers in the classroom. It was located in a junior school (JK-6) with a student population of approximately 280. It reflected a mixture of socio-economic and ethnic backgrounds.

The teacher had several years of practical experience with computers. His goals regarding word processing in the classroom were twofold. He wanted his students to experience computers and be comfortable with them. Word processing served as a means to this end. Secondly, he believed that word processing would reduce the occurrence of writing errors and encourage a longer product. He planned to have the students use Storywriter, followed by Bank Street Writer.

Word processing was used for story writing, special project reports in subject areas such as social studies, and activities related to daily language tasks. Typing skills were introduced using the software program, Typing Tutor. Students often entered work from handwritten copy.

Generally, students in this class had no previous school computer experience. Initially, the teacher introduced the students to the basic processes of cursor movement, loading, saving, and control functions. Students used programs such as Hangman and Monster Math to attain some degree of comfort with the machine. Students usually had access to the computers before and after school hours and during the last half of the lunch hour in addition to allotted class time.

In the fall, based on students' computer abilities, the teacher organized the class into seven computer groups, each of which represented a range of abilities. The most proficient

member of each group was designated the leader. The teacher met with all of the leaders one afternoon per week to discuss the computer activities of the class and ensure that they had the expertise necessary to assist their own groups. Each group then had a turn at the computers for one half day per week with one student per computer. The teacher would have preferred to allow students a whole day at the computers but felt this would result in too great a time lapse between sessions for any one group. As it was, the once a week scheduling meant certain skills could suffer due to lack of practice.

One particular group served as the focus for observations. According to the teacher, it consisted of the classroom's top student as group leader and two who find school work difficult.

CLASSROOM CONTEXT

THE PHYSICAL SETTING

The students' desks were arranged in five rows. The computers sat at the front of the room, off to one side, facing the class in two rows. They were at desk height. Although this program had its promised number of computers from the start, it did not receive a printer for the C64's for two months. There was a printer for the PET.

The computer area was a somewhat cramped arrangement. However, its location was easily accessible to the teacher.

CLASSROOM MILIEU

Interaction between the teacher and the class as a whole was common. While students were at the computers, other class activities would be in progress. Sometimes the attention of the computer group would be requested by the teacher for a short time. At other times, the teacher's interactions with the class would be unintentionally distracting. Thus, the word processing time was not uninterrupted.

Until the student group leaders gained confidence and expertise themselves, the teacher was the computer problem-solver. This might result either in the students waiting for his assistance, or the rest of the class working without him. However, neither the teacher nor the students seemed particularly frustrated by this occurrence.

TASKS AND OUTCOMES

TYPING

Before the computer groups were formed, students began using 'Typing Tutor' and 'Word Invaders' to gain familiarity with the keyboard. Typing Tutor is a software program that teaches typing skills. Word Invaders is a typing game: words are the 'invaders' which the student must type quickly enough in order to stop the 'attack'. It promotes speed in locating

keys. The teacher encouraged students to use both hands and keep them on the appropriate side of the keyboard. All students worked regularly with these programs. As well, students could use the computers if their desk work was completed.

WORD PROCESSING - STORYWRITER

By the middle of the first term, all students had been introduced to Storywriter. Both composing and copy typing were done. Students might be assigned to type poems from their workbooks that were to be memorized for an upcoming test. Once the assignment was done, students could choose what they would do for the remainder of their allotted time.

Of the group most often observed, the leader was very comfortable with Storywriter. She typed with two hands, but generally only one finger of each. She could locate the keys and type quite quickly. The other two students tended to type with only one finger and had trouble finding keys.

These two students, while expressing pleasure in working at the computers, did have some difficulties. They continued to need assistance in loading the Storywriter program throughout most of the first term. Either they would spell Storywriter incorrectly, resulting in a 'syntax error' message, or omit one of the component symbols of the command, such as a comma. The students would be aware that an error had been made, but be unable to determine its source or meaning. Further, a facility with the insert/delete key was not demonstrated. As witnessed in other programs, students would delete their work back to a misspelled word or other error, rather than cursor back and use the typeover or insert function. To a lesser extent, this behaviour was evident throughout the year.

Observations of the group leader's interactions with the other two members illustrated some of the difficulties of this approach. The purpose of the group leader was to assist the other students. At the same time, the group leader wanted to complete her own work. This could lead to a conflict of interest. The group leader was not always pleased to stop her work to help the others. Sometimes her assistance would be directly requested by the other students. At other times, the teacher would recognize that help was needed and would remind the leader that this was her responsibility.

The other main issue of the peer helper phenomenon is that of determining what types of helping behaviour will actually benefit the learner in the long run. More often than not, if asked for help, leaders would actually do the work or solve the problem for the learner. If this demonstration is done too quickly and/or not discussed, the learner gains little understanding from the experience. This phenomenon was common to many of the programs observed.

CLARITY OF TASK

While having more than one student work at the computers appeared to be motivating it could also promote confusion. If some students were not clear as to the task to be done they

might follow another's lead. If that student was not heading in the right direction, the entire group was led astray.

The following will serve as an example. Students were to compose either a story or a poem for Remembrance Day. All three students in the group were working on this. The leader and one member were composing stories. The other member copied a poem he had written and then proceeded to compose. At one point, the leader referred to an encyclopedia to check a date regarding World War I. The other two students appeared to be having trouble deciding what to write. Seeing the leader refer to the encyclopedia prompted both of them to do the same. In the end, all were copying chunks of information from the books.

Upon discovering this, the teacher suggested that this endeavour would be more fitting for a history project, but not for the assigned task. This project was to reflect the individual's thoughts, not facts from a book. The two boys seemed to have a difficult time composing something on the topic without the books to help them.

This group did not represent most students, including as it did the highest and lowest ability students of the class. Perhaps the grouping would have been more compatible if the leader and its members were closer in ability. It seemed that the lower ability students had difficulty with the tasks, in conjunction with the machine and word processing program. These observations point to some of the issues surrounding the use of computers and word processing with lower ability students in this type of setting.

Attempting to track the amount of writing accomplished by this group during any one session was made difficult in several ways. Students might return to their desks for certain activities. Or, they may stop their work at the computers to listen to the teacher, either as instructed or of their own choice. Further, they seemed often to be working on a variety of tasks during one session. And, too, they would delete their work to correct it rather than use the insert function.

BANK STREET WRITER TUTORIAL

At mid year, the class began using the Bank Street Writer (BSW) tutorial program as an introduction to this word processing program. It consists of five lessons that cover the basic functions needed to run BSW, such as the insert/delete function, cursor movements and erasing. The tutorial takes approximately 20 minutes to work through. The teacher wanted students to have two turns at using the tutorial before moving on to the word processing program itself. Since BSW ca not be run on the Pets, only three machines could be used.

Again, the two slower students of the group observed appeared to have difficulty with the tutorial. It demands quite a bit of reading. These students had trouble reading and understanding the text. They were seated beside each other and one was attempting to follow what the other one was doing, but both were in difficulty. And again, the group leader was involved in her own activity: typing a lesson from her social studies workbook with Storywriter; only attending to the other two students when requested.

BANK STREET WRITER

Bank Street Writer was introduced to the class in the new year. Due to the need to switch back and forth between menus for various functions, it could be somewhat tedious to use. The teacher had seen a program called Paperback Writer and thought it would be much easier, but he thought that at least BSW could offer more flexibility than Storywriter. Students seemed to enjoy it.

Students continued to use word processing for the same variety of activities as with Storywriter. Copy typing of handwritten projects or class assignments appeared to be the main application. The familiar problems of copy typing were in evidence: where to put the copy, and how to follow it. It was a slow process. In one instance, students representing an average ability group were typing the words to the song When I'm 64. After a half an hour, they had typed one verse (8-10 lines). As well, one of the students was having some difficulty with BSW and commented that she forgets things because she only uses it once a week.

Typing skills were wide ranging. Some continued to use one finger and were slow in finding keys. At the other extreme, students used two fingers on both hands and were quick. The teacher encouraged students to use both hands on the appropriate sides of the keyboard and was satisfied generally with the level of typing skills attained.

REVIEW OF PROGRAM

Overall, students were enthusiastic about the computers and enjoyed using them. Various degrees of word processing ability were achieved. Writing improved in that many errors were corrected on screen, resulting in a better looking product. Students were more inclined to produce a number of drafts for certain projects. Most could use two hands for typing. The teacher perceived that the better students seemed more able to compose at the keyboard than the lower ability ones.

The fact that this classroom had three C64's and one Pet was a drawback. Also, carpeting would have helped reduce noise level. The teacher was aware of the furniture limitations and would have preferred more comfortable chairs and a larger table setup to better accommodate the equipment.

The computer group and leader idea was seen as successful. With time, the leaders became better helpers to the other students. The teacher thought that this approach freed up his time and would be crucial for a teacher setting up computers for the first time.

A lab situation was viewed as desirable by this teacher. He thought that a lab that could be shared amongst several neighbouring schools was conceivable. But, he did not view computers in the classroom as a problem. In fact, barring a lab, he wanted more computers for his class.

However, as the number of computers increases, so too do the number of potential technical difficulties and equipment breakdowns. Repairing equipment can take weeks. Thus, this teacher

felt that some 'spare parts' should be readily available on a loan out basis in order to maintain the class program.

SUMMARY

1. The half-day scheduling of students to computers meant that while each computer period was intensive in length, students only experienced this once a week. The lack of frequent ongoing use could result in skills being forgotten, including those of keyboarding.

2. Having two types of microcomputers that could not run the same word processing program made the organization and execution of certain tasks more complicated.

3. Designating and training leaders within each computer group was intended to reduce demands on the classroom teacher. However, leaders could not always successfully attend to their own work and that of others. As well, leaders may need training not only in computer or word processing skills, but also in helping skills.

4. Generally, group members exhibited co-operative behaviour. And again, as in other cases, a number of students working at computers seemed to create a motivational effect. However, group decisions regarding the task were not always correct.

5. The difficulties of copy typing were frequently observed.

DISCUSSION

In presenting the details of each case, the focus was selective. While an attempt was made to provide a fair and complete perspective, the specific examples of teacher and student behaviour were chosen to illustrate particular issues. The case details are reality-based, but no claim is made that they are the only reality.

The cases were chosen to represent a range of word processing environments. Thus, the features of these cases illuminate a variety of issues on the use of word processing for elementary language programs. The relevance and implications of most issues depend upon the specifics of each case. For instance, keyboarding has different implications in a primary classroom than it does in a senior lab. This is due both to levels of student maturity and the equipment setups. On the other hand, in spite of the diversity of cases, several observations were common to all. The following discussion is organized in terms of common features, younger vs older students and regular classrooms vs labs.

COMMON FEATURES

In terms of the physical setups, most cases exhibited visible limitations to various degrees. For many students, the height of the tables appeared awkwardly high in relation to the seat level. Thus, students lifted their lower arms up to use the keyboard. The table

height also made copy typing a more difficult task. Copy typing could be further frustrated by the lack of an appropriate location for the copy.

Regarding hardware, several of the teachers remarked on the need for an improved printer setup. This would entail either a larger number of printers or a system to allow more computers access to the same printer. Without these improvements, the printing process complicates the word processing activity.

Teachers were generally satisfied with the word processing software used. Software which combined graphic capabilities with writing seemed to be particularly enjoyed by students. Improvements in the types of writing software available may well have an impact on writing outcomes.

The fact that a number of computers were present in each case appeared to be of importance, promoting positive social and academic outcomes. The simultaneous involvement of students with computers appeared to establish a working environment that was motivational in terms of the task. Further, students would help each other and read each other's stories. It appeared that students might learn and accomplish more by working in conjunction with others even if the work being done was of an individual nature; that is, even though these settings did not represent 'co-operative learning environments', the group process at work appeared to have a positive impact on outcomes.

Also within the context were the teachers themselves. The teachers involved were special, committed to word processing and to overcoming barriers to its effective use. These teachers may have coped with some circumstances that would prove severely problematic to others.

Further, the teachers were the first to emphasize the importance of the overall program structure into which word processing fit. Word processing was a means to certain ends. It represented one facet of a comprehensive approach to language development.

Whether male or female, all students seemed equally interested in word processing. Outside of the special education settings, several teachers expressed the opinion that both high and low ability students seemed to experience the most noticeable benefits from writing at the computers. Overall, teachers and students seemed to view word processing as a successful and beneficial experience.

In terms of the task, the word processing activities maintained students' attention. Students always appeared engaged in the task. Student interaction that occurred would relate to some aspect of the task. There seemed to be the perception that word processing was not 'work', or was at least a different kind of work. Yet, equally apparent across situations was the observation that students have difficulty approaching the task of revision.

Editing activities tended to be of a surface nature, i.e., spelling, grammar, and punctuation. While infrequently observed, higher order editing procedures such as text moving were more likely to occur with older students. Even though word processing simplifies the

revising process, students were generally not inclined to correct their work without insistence and/or assistance from the teacher. While writing with word processing appeared to interest most students, the revision process was not so attractive.

Apart from the fact that certain language skills are required for editing, students seemed resistant to the idea of returning to a task which seemed complete, i.e., their stories. If this is one of the obstacles to revision, then peer editing might serve to alleviate this, that is, the idea of editing another's work might appear as a new and different task that has its own rules and is distinguishable from one's own writing task. In fact, writing can be viewed as a personal creative endeavour, while editing is a more technical and objective task.

As with editing in general, word processing lends itself to peer editing due to the on-screen access, the ease of correction, and the legibility of the product. And, although a formal peer editing procedure was rarely in evidence, the teachers agreed that it was a potentially profitable process and several would try in the future to employ its use. The fact that it was not widely observed seemed related to time and scheduling constraints rather than a lack of teacher interest.

Peer editing was viewed as beneficial to the peer reader as a form of language (reading) experience. Further, when approached as conferencing, it could foster co-operative interaction amongst students and might produce motivational effects of increased interest and attention to the task. However, peer editing outcomes in terms of the written product remain dependent upon the language proficiency of the reader/editor.

Peer editing can be viewed as a specific form of peer helping. As such, it can suffer from the type of constraint common to the larger area of peer helping or tutoring. Even if the reader/editor is proficient with written language, the question remains: How can that student 'help' another in a way that is most profitable?

While the foregoing discussion speaks to the topic of writing with a word processor, it is also a reminder of the multi-dimensional nature of this topic. Some of the observations regarding word processing could apply to a variety of computer applications. Likewise, observations regarding the writing process might apply equally to the computer as to paper and pen. Thus, to speak of word processing as a writing tool is to address the complex interface of language and technology.

YOUNGER VS OLDER STUDENTS

While some observations are relevant to all cases, one major differentiating factor governing the results and their implications is the age of the student. The issue of furniture size is most applicable to younger students. If sustained keyboard activities are to be expected, appropriately proportioned tables and chairs should be available.

Not surprisingly, younger students exhibit the least facility with the keyboard and various machine functions. Yet, whether this should be of concern remains a question. While

younger students type more slowly than older students, they also tend to write shorter stories. The rate of composition at the keyboard appears governed as much by the students' cognitive processes as by their level of typing ability. Thus, while typing might appear laborious to the adult observer, it did not seem to frustrate the composing process. Lack of typing skills was most evident during the copy typing process. Further, the overuse of the 'delete' function slowed down the process, whether composing or copy typing.

With older students, the issue of keyboarding skills is perhaps more salient. Their cognitive maturity allows for an ongoing flow of ideas. If the technology is to assist the writing process, then typing skills must be sufficient to maintain pace with the cognitive flow.

Also stemming from developmental differences, the objectives with younger students are different than with older ones. Younger students are encouraged to write more and longer stories; to gain basic experience with written language. Their needs for editing functions are usually those of insert and delete. Editing consists of surface corrections.

With older students, more attention is paid to the editing process. Their cognitive maturity allows them to take advantage of more of the functions offered by word processing. As with keyboarding, the progress of older students can be impeded by lack of word processing skills.

REGULAR CLASSROOMS VS LABS

While the above discussion addresses some of the differences inherent in word processing with younger and older students, a major factor which will have an impact on students of any age is that of access to equipment. Skills such as keyboarding can only be developed and sustained with regular and frequent practice. In terms of the cases studies, this is one of the differences observed between the regular classroom and the lab situations. The special education cases resembled labs more than regular classrooms in their operation; thus statements made regarding labs apply to them as well.

In the future, the case of the regular classroom containing several microcomputers (3-6) is likely to become more common. Two such classrooms were included in this study. The following comments are intended to highlight key features of these environments.

1. A number of computers in the regular classroom can create a physically congested situation. Further, their location in the room is dictated by the availability and proximity of electrical outlets, which can result in less than optimal placement.

2. The initial start-up time required by a regular classroom program appeared longer than that needed in a lab situation. The need to create groups and train students meant that the applied use of word processing took longer to achieve.

3. Students have a limited amount of time to use word processing because of the smaller number of machines available. The time is too short for many students to develop proficiency in keyboarding or machine functions.

4. There is limited interaction between the teacher and students at the computers. The teacher's attention is divided between the ongoing classroom activities and the demands of the computer users. Thus, the teacher is able to attend to the process of using microcomputers irregularly.

5. Whether formally instituted or not, student computer experts were a feature of regular classrooms. With the teachers' primary responsibility being the maintenance of the overall classroom program, student experts act as computer assistants.

6. Students tended to copy type rather than compose with word processing. This appeared to arise from the shortage of available time at the keyboard and the structure of the classroom program.

7. Word processing seems to be very much an add-on in the regular classroom. Many constraints inhibit the extent to which it can be integrated into ongoing classroom routines. One of the more severe constraints is teacher time both in and out of class.

Some schools are now massing the microcomputers into laboratories for use by full or half classes on a scheduled basis. From the cases observed, some of their more distinctive characteristics were:

1. The teacher could concentrate on computer activities, interact more with the students, and monitor outcomes better than in regular classrooms.

2. Labs represent student-directed learning environments. The teachers can be responsive to student needs.

3. Because all students are engaged in computer work, they are not being distracted by other activities, nor can the computers be distracting to other students.

4. A lab is a structured environment which allows for continuity of a program through the regular daily scheduling. However, if the lab instructor is not the regular classroom teacher, communication between the two is necessary for word processing to be integrated with regular classroom work.

5. A lab is a more egalitarian situation where all participate and learn together. The roles of student expert and novice are much less evident.

6. Students appear motivated to work within the context of the group situation.

7. Students may learn more from each other in lab setups since the range of expertise available is increased due to the larger number of students involved.

8. Labs allow for a broad range of tasks, either highly structured, or open-ended, depending upon the teacher's goals. Because the lab allows for more consistent monitoring of outcomes, the appropriateness of the task is more readily determinable.

Word processing in the regular classroom may be beneficial in several ways. It can be a way of introducing students to the computer as a tool. Thus, it can allow students to become comfortable with the technology and acquire some relevant skills. All students appreciate the ease of correction and enjoy seeing the clean, finished printout. It would seem that the use of word processing encourages students to write. Further, the use of word processing with groups of students appears to create motivational and social impacts.

However, the regular classroom setting appears to suffer more constraints than the labs. Most significantly, for word processing to be fully integrated into a writing program, students need regular and frequent access to equipment in order to develop and maintain necessary skills. Otherwise, technology will rule the outcome, rather than a student's writing ability. Even with several computers in the classroom, frequent access can be difficult to achieve within the context of an ongoing classroom program. The idea of increasing the number of computers in the regular classroom to solve the access problem is largely impractical, given the physical dimensions and setup of the room itself.

SPECIAL EDUCATION

As stated, the special education settings functioned essentially like labs. These programs operate with a small number of students and are thus afforded more flexibility than regular programs. Thus, even with a small number of computers available, students could have frequent access to them. The use of word processing and related language software appears particularly valuable to these students who often have difficulty with writing in particular and, in general, with attention to task.

Perhaps more common to special education settings than to regular classes is the practice of structuring tasks and the close monitoring of individual outcomes. In this sense, word processing is another activity to which these practices apply. With the smaller class size, teachers can be most sensitive to individual needs and abilities. So word processing should prove beneficial to special education students because the special education setting facilitates the exploitation of such a tool's potential.

CONCLUDING REMARKS

Literature on the subject of word processing as a language facilitator seldom considers the realities surrounding its application. This research suggests that the overall context in which word processing is used will govern the degree and/or type of success attained. Success must always be defined in terms of goals or purpose. Goals, to be realistic, must be set in

terms of resources available. Thus, in these terms, all of the cases studied could be perceived as being essentially successful, within their respective limits.

While the task might be identical in each case, e.g., story writing, the outcomes appear governed more by the context of use than by the nature of the task itself. Two of the most important contextual variables appear to be age of student, and equipment availability and location. Various combinations of these two main factors give rise to differences in other contextual factors such as teacher role including teacher-student relationship, and peer interactions. These feed into the task and affect its outcome.

The most apparent contrast existed between the potential of the regular classroom to integrate word processing vs that of the lab. Regular access to a lab situation with older students seems promising in the kinds of outcomes it allows for in terms of actual writing with the word processor. Typing skills are a prerequisite to the success of such a program and might be formally addressed at an earlier age in anticipation of this use. However, the word processing lab at the elementary level is an uncommon phenomenon.

Currently, computer instruction in the schools is discontinuous. Students who are provided the opportunity of extensive computer use during one year, may then face several years under more restricted conditions. If word processing is to be integrated as an important writing tool, then ideally students should be accumulating and advancing their expertise from one year to the next.

These seven case studies have provided a picture of current word processing activities within their respective contexts. Although cases represented exemplary situations, relative to current practices, a number of obstacles to the integration of word processing were in evidence. The importance of the overall context of use to the application of word processing was emphasized.

The results of this research have raised several issues and introduced many topic areas that appear to relate to the use of word processing in elementary language programs. Directly or indirectly, more questions have been posed than answered; these questions need to be addressed if the potential for word processing as a language tool is to be realized.

APPENDIX A

SOFTWARE PUBLISHERS

Bank Street Writer	Broderbund/Scholastic
ComputerType	Gage Publishers
MacPaint	Apple, Inc.
MacWrite	Apple, Inc.
Magic Slate	Sunburst Communications
PaperClip	Batteries, Inc.
Ready, Set, Read	Etobicoke Board of Education
Story Maker	Scholastic
Storymate	Etobicoke Board of Education
Story Tree	Scholastic WizWare
Storywriter	Joe Vayda, Toronto Board of Education
Superscript	Precision Software

APPENDIX B

RELATED READING

Much literature was surveyed prior to and during the course of this research. For the most part, reports that specifically addressed word processing with elementary school populations paid scant attention to existing conditions of classroom life. Preliminary classroom observations, however, pointed to the necessity of appreciating the conditions within which word processing is used in order to realistically assess its potential.

Considering the range of subject areas that such an approach encompasses, the amount of related literature is overwhelming. Not only are there hundreds of journal articles on the topics of educational computer use, word processing and writing, but, other relevant bodies of literature include school organization, innovation and change, cognitive development, group processes, co-operative learning environments, peer relations, and teacher role. As the preceding list indicates, to approach the study of word processing in elementary classrooms is to recognize it as one part of a much greater whole.

Following is a selected sampling of references which touch on several of the aforementioned areas. Also included are several references addressing research issues and methodology.

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